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THE INVENTORS' INSTITUTE

4, ST. MARTIN'S PLACE, TRAFALGAR SQUARE.

Chairman of the Council—**SIR ANTONIO BRADY.**

THE various efforts which have been made, and the numerous influences now at work to injure, if not to destroy, Patent Rights; the inefficiency of the many well intended, but ill considered, schemes of Patent Law Reform which have from time to time been suggested, and the tendency of which has generally been to prejudice the Inventor, without advantage to the Public; together with the proceedings so essentially involving the interests of inventors which have already taken place in Parliament, show the necessity of an immediate and active co-operation on the part of those interested in Inventions and in Patent Property, and that an Association for the Protection and Defence of Patent Rights is urgently needed. This Institute has, therefore, been established for the purpose of uniting and organizing the influence of Inventors, Patentees and others. Its objects are:—

1st To protect Inventors' interests and defend the privilege of obtaining her Majesty's Letters Patent.

2nd To promote improvements in the Patent Laws.

3rd. To facilitate the diffusion of information with reference to Inventions and other subjects beneficial to Inventors and Patentees.

The qualification for Annual Members of the Institute is a yearly Subscription of One Guinea, and for Life Members a single payment of Ten Guineas.

Persons desirous of becoming members are requested to forward their names and addresses to the Secretary.

THE
INVENTORS' PATENT-RIGHT ASSOCIATION,
LIMITED,
21, Cockspur-street, Charing-cross, London, S.W.

Objects of the Association.

To obtain Patents for Inventions in this and other Countries at fixed and moderate charges.
To Register Designs.
To Sell and License Patented Inventions.
To form Public Companies, or otherwise arrange for the Public Introduction of Patented Inventions.
To furnish advice and Professional Assistance in developing Inventions.
To collect Evidence, arrange Arbitrations, and otherwise assist Inventors in maintaining their rights.
A Handbook gratis on application to
THOMAS MORGAN,
Secretary.

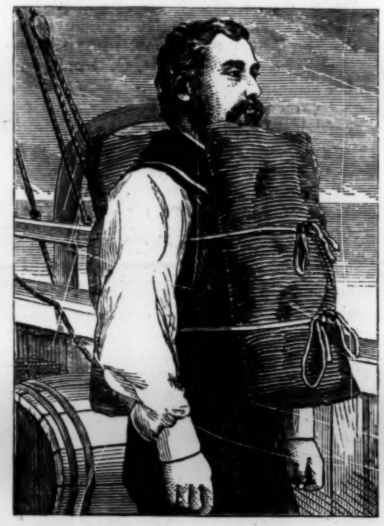
Recently Published, price 2s.,
THE LAW OF PATENTS FOR INVENTIONS. By F. W. CAMPIN, of Gray's Inn, Barrister-at-Law.
London: LOCKWOOD, Stationers' Court.

"ORTHODOX PHRENOLOGY."
Cloth, Second Edition, Illustrated.

This work is arranged for the special use of learners, also to show the harmony between Phrenology and the Anatomy of the Brain, and particularly to convert the Sceptic.

London:
SIMPKIN, MARSHALL, AND Co., Stationers' Hall-court.

ARTHUR WOODS'
PILLOW LIFE PRESERVERS,
For the use of Crews and Passengers of Steam and Sailing Vessels, Yachts, &c., in case of Collision, Wreck, Stranding, or other Accident.



The Patentee begs to call the attention of all Shipowners, especially owners of Passenger Ships, to his Patent Pillow Life Preservers, and to solicit a trial.

The Patent consists of two Pillows, which are used as ordinary Pillows in a general way, but which can be made available for saving life if required. They are fitted with tapes to sling them over the head and tie round the body—one Pillow on the chest and the other on the back. The above Illustration shows the way in which the Pillows are attached to the person. The Pillows being made of a very buoyant material, act as a Life-buoy in case of danger, and the advantages are so manifest that they merely require to be enumerated, as follows:—

1.—The ease and rapidity of attaching them to the person.

2—The perfect buoyancy of the person when in the water—a pair of these Pillows being capable of supporting a man of 20 stone breast-high.

3.—The protection they afford from floating wreck or dashing against rocks, &c.

4—The fact that by reason of being tied to the person there is no occasion for holding on to them as to a common Life-buoy.

5—The Pillows being lashed the narrow way across the chest and back, they do not interfere with the action of the arms in any way, and a person could swim, haul a rope, or pull an oar, without the slightest inconvenience.

6.—The slight cost is another feature—because the two Pillows being placed at the head of the mattress make the mattress so much shorter and consequently cheaper.

7.—These Pillows can be used as Boat Cushions at watering places, and, in the event of a person falling overboard, or the boat upsetting, used as Life-buoys.

PRICES ACCORDING TO QUALITY.
Application to be made to the Agents,
A. BLAIN & SON, 35, Paradise-street, Liverpool,
WILLIAM JONES, Ship Flag Maker, 14, Bath-street, Liverpool.
SOLE AGENTS FOR LONDON,
S. W. SILVER & Co., Cornhill, E.C.
For Estimates address the Patentee,
ARTHUR WOODS, 352, Westminster-road, Kirkdale, Liverpool.

APPLICATIONS FOR LETTERS PATENT.

*** In this list (Com.) means Invention communicated from abroad.

Further information, as to the progress of these Patents by Notice to Proceed, Sealing, and Specifying, can be obtained at the Office, 21, Cockspur-street, Charing Cross.

On January 12th.—100 to 120.—W. R. Lake. Rivets, and machinery for manufacturing the same, also a method of and machinery for inserting the said rivets in leather or other material (com.)—D. A. Fyfe and W. H. Bowers. Method of and apparatus for producing gas or gases for heating and for illuminating purposes. —T. Flitcroft. Construction of carding engines. —T. Howitt, S. Walker, and J. Gibson. Means for stopping bottles and other similar hollow articles.—W. H. France. Circular combs and other combs employed in combing wool and other fibres.—W. A. Lyttle. Process for the smelting, or the reduction and manufacture from their ores, oxides, sulphides, or chlorides of iron, or the carbide of iron called steel, or of other metals.—F. A. De Burgh. Pipes for smoking, which are also applicable to cigar tubes and cigarette tubes.—B. F. Weatherdon. Disinfecting fluid (com.)—A. Higginson. Motive-power engines and pumps.— H. Russell. Means or apparatus for indicating, recording, or registering the number of articles or garments sent to laundries, and for other similar purposes.—F. Cole. Machinery for crushing or reducing to impalpable powder barytas, cocoas, refined sugar, and similar substances, both vegetable and mineral.—W. M. Gee. Vessels for holding liquids, and cases or receptacles for the same.—J. C. Sellars. Cement.—S. Rideal. Lattice framework covering for the floors, roofs, and sides of railway carriages, for buildings, and other purposes.— A. S. Tomkins. Cooking stoves known as the Victoria cooking stove.—A. M. Clark. Knitting hats, caps, and other articles, and machinery for the same (com.)—W. Chadburn. Apparatus for indicating the direction and speed of revolving shafts, particularly those of marine steam-engines.—R. T. Heape, jun. Condensing carding engines.—F. J. Britten and W. S. Barron. Centrifugal apparatus.—H. Brinsmead. Rotary screens.—A. Browne. Converting cast-iron, wrought-iron scraps, old rails, and such like materials, into steel, or metal having the properties of steel (com.)

On January 13th.—121 to 138.—J. H. Smith. Lock-stitch sewing machines.—R. R. Holmes. Aerated liquors.—T. Casson. Hydraulic engines.—F. A. Gatty. Preparing certain materials employed in printing and dyeing cotton fabrics and yarns.—W. Brookes. Metallic cartridges (com.)—J. N. Smith. Journal boxes for railway cars.—R. Main. Apparatus

BRITISH MUSEUM

for ascertaining the temperature of hot blasts.—G. Scott. Furnaces used in the manufacture of glass.—W. Green. Preparation and treatment of soaps, and combining therewith certain vegetable, farinaceous, or equivalent natural matters, also apparatus or means therefor, parts of which improvements are applicable to other soaps.—T. North. Axle-boxes, and appliances appertaining thereto (com.)—J. Lee. Breech-loading magazine fire-arm. (Complete specification.)—R. Jucker. Construction of a machine for cleaning knives and forks. M. Wright and J. Pollard. Driving spindles by means of bands. (Complete specification.)—J. T. Staniland. Brakes for perambulators.—H. Y. D. Scott. Purification of coal gas.—G. R. F. Sinibaldi. Method of and apparatus for preventing the formation and explosion of gas in the storage, transport, and delivery of gaseous or inflammable oil or spirit (partly com.)—G. H. Lewis. Method of producing a draught through cigars to facilitate the smoking thereof, and implement for that purpose.—J. H. Johnson. Extinguishing fires, and apparatus or means to be employed therefor (com.)

On January 14th.—139 to 157.—G. H. Nussey and W. B. Leachman. Punching, shearing, and rivetting machines, and the means or apparatus employed for conveying and imparting the required motion and pressure to the same, such means or apparatus being applicable for other purposes.—J. O'C. Cave. Apparatus for navigating the atmosphere.—J. O'C. Cave. Construction of apparatus capable of being employed as an automatic governor or steam regulator, steam gauge, safety valve, and high steam alarm; and also for regulating the flow or pressure of air, gas, water, and other fluids.—J. Armstrong. Self-locking switches for railways.—E. P. Stokes. Boat lowering apparatus.—R. Mallett. Production of plates or surfaces containing inscriptions, marks, or devices, and the machinery or apparatus employed therein.—W. Nelson. Spring scarf clip or adjuster.—W. Morgan-Brown. Looms for weaving (com.)—J. Hargreaves. Manufacture of sulphates and apparatus employed therefor.—A. Lupton. Self-lubricating wheels and axles for corves or trams used in coal and other mines, applicable to other surfaces requiring lubrication.—W. Humble. Construction of lifeboat.—G. Rydill. Machinery and apparatus in the construction and working of vessels, tanks, reservoirs, and areas, for the treatment of sewage and dye waters, also treating, purifying, and preventing the pollution of rivers and streams, so that towns may be supplied with water for domestic and manufacturing purposes, and machinery, apparatus, and materials used for supplying waterclosets with water, and for other purposes.—W. Absalom and E. Griffiths. Method of and apparatus for steering steamships.—R. G. Perry. Drying peat and other substances, and apparatus for accomplishing the same.—H. E. Newton. Burners for lighting purposes (com.)—A. Turner. Manufacture of elastic fabrics.—S. Chatwood. Fitting ships and other floating structures to protect them against fire.—S. H. Johnson. Cocks or valves. (Complete specification.) — J. G. Willans. Furnaces.

On January 15th.—158 to 170.—J. H. Gartside and C. T. Bradbury. Machinery or apparatus for finishing woven fabrics. — R. P. Pope. Formation of walls, partitions, floors, and roofing of buildings and other structures.—P. E. Gay. Rotary machinery for excavating and cutting rock and other material.—H. Rogers. Chisel-pointed cut nails, and machines for the manufacture of the same (com.)—J. Marshall. Thrashing machines.—W. R. Lake. Machinery or manufacturing spikes (com.)—T. Gilmour. Safety valves. — C. N. Cowper. Economic system of heating.—W. Reid. Sewing machines.—P. Jensen. Construction of hygrometers (com.)—F. G. Bennett. Roller skates.—A. M. Clark. Kite or aeriel apparatus for military and other purposes (com.)—J. C. Scott. Machinery for moulding toothed wheels and other circular articles.

On January 16th.—171 to 182.—W. Alston. Adjustable chairs and other seats.—W. Jolley. Railway signals, and the method of working the same, partly applicable to signalling in foggy weather.—M. Gandy. Construction of wheels for railway rolling stock.—M. Bayliss and E. Jones. Nuts and washers for screw bolts.—P. Vera. Gas or hot air engines heated by heat generated by chemical action igniting hydrogen and oxygen gases to form water.—D. Longsdon and P. Toppin. Construction of shoes for horses and other animals.—B. Marsden. Machinery for making untapped nuts for screw bolts.—J. L. von Faber. Writing and drawing pencils.—G. Gledhill and W. Gledhill. Signalling apparatus to be used on railways.—E. Thompson. Rafts for passenger ships, and the means of launching rafts and ships' boats.—J. Box, E. Aubertin, L. Boblique, and H. Leplay. Manufacture of phosphate of iron, and its application to the preparation of alcaline phosphorus, and to the extraction of phosphorus.—J. B. Hewitt. Poleaxe, or instrument for slaughtering animals.

On January 18th.—183 to 193.— C. E. Hope-Vere. Apparatus for use in the cleansing of china, glass, and earthenware articles of domestic use.—G. Waller. Apparatus used in the manufacture of gas.—W. R. Lake. Machine for hanging wall paper (com.)—W. M. Scott. Breech-loading small arms. — E. E. Fitz. Method of mounting and operating globes. (Complete specification.)—G. Thornley and T. Buxton. Machinery for partially preparing wood staves for the manufacture of casks. (Complete specification.)—J. Worrall and A. J. Worrall. Machinery or apparatus for shaping wire, and cutting up the same into lengths.—E. Enoch. Machinery or apparatus for boring or drilling.—S Johnson and W. Allan. Apparatus for heating feed water supplied to boilers, and also for condensing surplus steam in boilers.—G. N. Taylor. Lamps for streets and other places (com.)—F. Wirth. Fire-locks especially applicable to the Henry rifle (com.)

On January 19th.—194 to 208.—J. B. Kuenemann. New and useful process in the production of glossiness and the application of mordants and dye on vegetable textiles (com).—H. A. Dufrené. Railway sleeper (com.)—E. P. Alexander. Stud or button to be called the "Excelsior" button, for fastening the ends of metal bale bands (com.)—O. C. D. Ross. Apparatus and means for utilising petroleum and other hydrocarbon liquids in lieu of coal or other fuel.—J. L. Clark. Gas regulators and lighting railway carriages by gas.—A. M. Clark. Machines for rolling bars for nut blanks (com.)—M. Mackay. Compounds for dissolving resins and gum resins, and for other purposes for which alcohol or methylated spirit is now employed.—J. Brierley, F. W. Brierley, W. W. Brierley, and F. S. Reynolds. Apparatus for locking and interlocking railway signals and points.—J. C. Graham. Boilers for steam-engines.—A. M. Dix. Axles for waggons, carts, carriages, and other vehicles.—J. P. S. Joliot. Machinery for stopping railway carriages, waggons and trucks.—J. Jeyes and C H. Turner. Lubricating apparatus.—C. F. Gardner. Machinery for shaping, channeling, and feathering the soles of boots and shoes (partly com.)—W. R. Lake. Process for preserving vegetable and animal substances (com).—R. H. Taunton, G. Hayward, and C. Knap. Manufacture of wrought iron tubes.

On January 20th.—209 to 226.—J. C. Johnson. Forming strip iron into skelps and welding the same into tubes applicable for gas, steam, water, or other purposes. H. J. Dorat. Gas burners, gas regulators, or apparatus for lighting by gas (com).—J. Mather. Means for producing gas from an admixture of atmospheric air with parafin, petroleum, naphtha, oil or spirit containing a large amount of carbon, the said gas being adapted for lighting or heating purposes.—J. Imray. Instrument or apparatus for bruising, masticating, or disintegrating food (com.)—G. Shand. Treating, improving, or maturing spirits, wines, malt liquors, and other liquids containing alcohol.—J. Box, E. Aubertin, L. Boblique, and H. Leplay. Disinfection of solid and liquid matters such as night soil, sewerage, either together or separately, gas and other foul waters.—E. T. Marler. Pencil cases or pencil holders (com).—F. D. Nardi. Machines for blocking the uppers of boots and shoes.—W. H. Smith. Treatment and manufacture of metals and other alloys.—S. Perkins and W. Smellie. Furnaces for heating and melting metals.—A. H. A. Ekstrom. Apparatus for bringing centrifugal pumps in action. — W. McPhail. Compositors' case frames.—J. C. Ramsden. Construction of driving band, specially adapted for driving the spindles of spinning, twisting, doubling, or winding machinery, also applicable for other like uses. J. Harvey. Close or open carriage on a pair of wheels to be driven from the outside or inside with single or a pair of horses.—W. M. Bullivant. Floating anchors to enable disabled steamers and other vessels to ride out heavy gales.—L. Perkins. Marine and other steam engines, and apparatus connected therewith, part of which are applicable to other purposes.—A. H. Cramp. Apparatus for stretching boots and shoes.—J. Lloyd and J. Scully. Hanging lines for drying wall and other papers, and also textile or other web fabrics.

On January 21st.—227 to 243.—R. Brakeborough and J. Beck. Hydrants and fire-cocks.—E. Moreau. Sewing machines. (Complete specification.)—H. P. Garland. Sewing machines for stitching sacks, bags, carpets, and for other like purposes. (Complete specification.)—J. H. Cheatle. Brushes.—T. Broadbent and J. Westerby. Method of and apparatus for regulating the cut-off valves in steam-engines with the governor. (Complete specification).—F. Rath and W. Scantlebury. Creased, folded, or plaited fabrics, and machinery or apparatus used for this purpose.—J. J. Perry. Wheel skates.—A. W. Gillman and S. Spencer. Mode of treating and bottling beer, and apparatus employed therein.—J. G. Ingram. Washers and packing-pieces.—J. P. Scott. Apparatus for heating and warming railway carriages by steam (com.)—R. T. Lewis. Ornamenting and hermetically sealing the backs of toilet and other detached looking glasses and mirrors.—R. Gunliffe. Railway chairs and apparatus for locking the nuts of screw bolts for railways and other purposes.—M. Hainsworth. Means or apparatus employed for extinguishing fires.—J. Howarth. Hot-air stoves and apparatus for warming and ventilating buildings, which apparatus may be used for drying wool, yarn, or other material. E. W. Furrell. Stand for holding charts and other illustrations (com).—J. Serriere. Furnaces for burning moist ligneous residues, wood, tan-waste, or other moist vegetable substances.—F. A. Luckenbach. Method of and apparatus for casting, annealing, and otherwise treating furnace slag or cinder for the production of a new material suitable for building, paving, and other purposes.

On January 22nd.—244 to 257.—C. D. Abel. Steam-boilers and their setting (com.)—W. Mason. Prevention of the incrustation of steam-engine boilers.—B. J. B. Mills. Rock reamers, which invention is applicable to other purposes (com.)—C. T. Brock. Apparatus for displaying fireworks.—H. Jones and J. Davies. Apparatus or appliances for stoppering bottles containing aërated and other liquids.—E. O. Aspinwall. Manufacture of wicks for candles and lamps.—W. Lancaster. Sizing and dressing machines, parts of which are also applicable to warping or beaming machines, and to looms for weaving.—C. W. Vosper, and G. P. Rogers. Sewing-machines and sewing-machine stands.—R. Weare. Apparatus for preventing or extinguishing fire in ships, under ground apartments, and other enclosures, part of the apparatus being useful for other purposes.—W. R. Lake. Apparatus for preventing fraud by the conductors of tramway cars and similar vehicles (com.)—R. Stokes. Manufacture of busk and similar fastenings.—B. P. Stockman. Electric signalling apparatus.—A. M. Clark. Manufacture of steel (com.)—R. Leach and J. Webb. Embroidering machines.

On January 23rd.—258 to 274.—J. F. Brown and J. Baird. Weaving figured fabrics and the machinery employed therefor. — H. C. Mayer. Spirometer. T. Lees and J. Pidgeon. Apparatus for curling the brims of hats.—C. T. Colebrook. Apparatus for raising water from wells or other places, or for raising other liquids.—H. Aylesbury. Stoppers for bottles for containing aërated and other liquids.—R. H. Manning. Grindless plane iron.—G. A. A. Manbré and W. A. B ldam. Steam boilers or steam generators. — E. C. Mills and H. Haley. Motive power engines, worked by the explosion of gas. — J. Friedländer. Apparatus for collecting grain-straws and other similar crops, and for binding the same into bundles or trusses (partly com.)—E. Newbold. Furnace bars.—D. Gill. Method for neutralizing the poisonous and offensive nature of sewer or drain gas, and to deodorize the sewage. W. Allen. Machinery for raising and forcing fluids and liquids.—C. A. McEvoy. Apparatus for extinguishing fire.—W. P. Savage. Apparatus for preventing accidents on railways.

(*Continued on page 78*).

PROPOSALS FOR AMENDING THE NEW PATENT LAW BILL.

PREPARED BY THE SECRETARY OF THE INVENTORS' INSTITUTE.

AMENDED BILL.

Clauses 1, 2, 3, 4, 5.—No particular alteration suggested.

Clause 6. (Appointment of Examiners and Assistant Examiners) 2nd paragraph.—To stand thus:—The number of the examiners shall be such number, as having regard to the duties of the said examiners the Lord Chancellor, with the consent of the Treasury from time to time, directs.

Clause 7. (Appointment as Referees of Persons Specially Qualified by Knowledge of Manufactures, Art, or Science).—It seems doubtful whether referees are desirable. If decided against, of course this clause should be struck out.

*Clause 8. (Application for Patent. *Full Specification* to be lodged therewith; opposition to be then allowed).—This clause should be altered thus:—An application shall be made by the applicant filing at the Patent Office the prescribed form of application and declaration; also a *provisional* specification describing the nature of the invention, and distinctly indicating in what manner it can be performed.*

Notice of the application shall be published, and any person having an interest in opposing the grant may file notice of opposition, with particulars of his objections.

An applicant may, however, if he thinks fit, file a complete specification.

**Here* (if provisional specification, as above, be allowed) the whole of the section 9, of Act of 1852, allowing deposit of complete specification, should be introduced.*

NOTE.—*If the caveat system, as hereinafter set forth, be thought worthy of adoption, then the 8th clause, as it stands in the Lord Chancellor's Bill, need not be altered.*

Clause 9. (Allowing Provisional Protection.)—Needs no alteration.

Clause 10. (Reference to Examiner.)—This clause should stand thus:—On the expiration of four months from the date of the application the applicant, if desiring to proceed with his application, must lodge a request for the grant and sealing of letters patent, and he must, unless a complete specification be already filed, file therewith a specification, that is, an instrument in writing, particularly describing and ascertaining the nature of the said invention, and in what manner the same is to be performed; and thereupon the commissioners shall refer the application to an examiner. The examiner shall be nominated to act in each case according to a fixed rotation, which shall not be made public, or in the other mode prescribed (if any).

NOTE.—*If the caveat system be adopted, then this clause need not be altered.*

Clause 11. (Examination and Report of Examiner.)—This clause should stand thus:—The examiner shall consider the application,* provisional specification (if any),* specification and relative documents, and shall report to the commissioners thereon, and especially with reference to the following subjects:—(*a.*) Whether the invention is a proper subject for a patent within the Statute of Monopolies. (*b,*) Whether the specification is sufficient,* and not inconsistent with the provisional specification (if any there be).* (*c.*) Whether the invention appears to be open to objection on the ground of want of novelty, as far as can be ascertained from former specifications and other documents and publications in the Patent Office. The examiners shall also report their opinion on the case presented in writing by an opponent (if any).

(*d. e.* Graduating inventions as worthy of 7 or 14 years, according to importance. Also requiring report as frivolity.) *d. e. f.* are wholly objected to, and should be expunged.

Clause 12. (Association of Referee with Examiner.)— See remark on clause 7. If referees are not to be appointed, then, of course, this clause should be struck out.

Clause 13. (Reference to Law Officer.)—This should be altered thus:—After the report of the examiner,* or of the examiner and referee or referees,* if adverse to the applicant or notice of opposition has been filed and not withdrawn, the commissioners shall transmit to the law officer the application,* provisional specification, if any there be,* specification, and relative documents and report.

2nd paragraph:—Not objected to.

3rd paragraph:—The law officer shall consider the same, and may, if he thinks fit, hear the applicant and any person who has filed notice of opposition.

REASONS FOR AMENDMENTS.

Clause 6.—The number two examiners and four *assistant* examiners can by no possible calculation of the work to be done be deemed adequate.

There seems to be no necessity for a grade of *assistant* examiners; a man equal to the work of examination ought not to be placed in position of inferiority to anybody.

Clause 8.—It has been well agreed, on nearly all sides, that a cheap preliminary protection on an understandable description of the invention, which need not amount to a complete specification, whether by caveat (£1), in which case the clause as it stands in the Bill could remain. Or, as seems to be more generally desired by provisional protection, £1 on the deposit of a provisional specification. Without preliminary protection, an inventor would in many cases be robbed of his invention in the progress of its development, for in the absence of this kind of protection, until an invention is perfected in *all its details,* no security *can be* accorded to the inventor; therefore, if he resorts to the aid of professional engineers or workmen (which he very often requires), he must do so at the peril of having his invention filched from him, and it will not cure this simply to provide opportunity for opposition, for in practice it is well-known that it is very seldom possible to prove that an invention has been filched away from another person. Indeed, an inventor would be unable to consult his patent lawyer or patent agent without risk, because a complete specification takes some time in its proper preparation, and thus leaves plenty of time for malpractices. This of course is much less to be dreaded than the misdoings of mechanical men and workpeople. The power of making amendments and additions to the specification, although most beneficial, does not wholly remove the above objections, because a defective specification patched up into a complete document will generally end in a muddle.

The Examination system, if carried beyond *patentability* and *novelty* and sufficiency of specification—(in fact, even the question of patentability, or nonpatentability, is very difficult to properly decide in the *outset*)—will be often useless and fraught with difficulties and objections of various kinds.

No man or set of men can, with any certainty, decide as to the "frivolous character of an invention." What will appear frivolous to some persons will be considered important by others.

To graduate inventions as to their importance will be even more difficult; so that a system based upon comparison of degrees of importance—seven years to some inventors, fourteen to others—would prove highly unsatisfactory.

Clause 12.—The limited use of referees would, in some cases, be advantageous; for the examiners, unless excessively numerous, would not possess the special technical knowledge that may be desirable for the proper consideration of every case.

It may, however, be a question whether nice technical points need be entered into by the examiners, and whether such points should not rather be reserved for the law officer to adjudicate upon, assisted by referee or referees.

Clause 13.—When the examiners' report is favourable to the grant of letters patent, and there is no opposition, any reference to the law officer will, in practice, be useless waste of time. The law officers are not chosen with regard to any special fitness for the work of examining into patent matters, they have plenty of important public work to do, and can only be really useful in disputed cases.

4th paragraph:—The law officer shall report to the commissioners his opinion whether a patent may be allowed for the invention or not. The commissioners shall then render *accessible to the public* the application,* provisional specification (if any),* specification, and relative documents and reports.

5th paragraph:—To be struck out.

Clause 14.—To be struck out.

Clause 15.—If the law officer, when reference has been made to him, or when no reference has been made to the law officer, and the examiner reports,* or examiner and referee report,* in favour of application, the commissioners shall, on lodgment of a request for grant and sealing of letters patent, prepare and submit to the Lord Chancellor a patent with the warrant for sealing thereof.

Where the law officer has reported against the application, the applicant may petition the Lord Chancellor for grant and sealing of patent.

Clause 16.—Not objected to.

Clause 17.—Strike out 1st paragraph, it being useless.

2nd paragraph:—No patent shall be sealed sooner than seven days before the expiration of provisional protection,* or protection on complete specification,* unless notice of lodgment of request for sooner sealing thereof be given in the *London Gazette*, and published in such other way as may be prescribed fourteen days before the commencement of such period of seven days; and any person who may have obtained a provisional protection, or protection of earlier date, shall, upon objecting to such sealing, have power to stop, subject to the decision of the Lord Chancellor, the sealing thereof earlier than the said period of seven days. Every patent shall be dated the day of the application, but it shall not be competent for the patentee to take any proceeding in regard of an infringement committed before the application, provisional specification (if any), specification, and relative documents have been open to public inspection, which shall be the day after the specification* or complete specification has been filed.*

Clause 18 to 48 inclusive.—No alteration, *except that* (27) *compulsory working and licensing clause be struck out altogether.* See also opposite column as to 22.

Clause 49.—(Power to commissioners to make regulations on a great variety of matters):—

Strike out the words "and of models." Add to this clause at end thereof:—

"Provided always no general rules or orders under this Act shall have any operation or effect, unless 21 days before they are to take effect, the same have been presented to both Houses of Parliament."

N.B.—*In case the above alterations effecting the retention of the provisional specification system be not adopted*, then a clause should be added to the Bill as follows:—

Caveats may be entered to bar proceedings on applications for patents for any subject matter set forth in any such caveat without notice, and liberty of opposing same being afforded to the person so entering a caveat; and any opposition entered upon a caveat shall be treated according to the due course of opposition cases.

The person entering a caveat may make a special request that the examiner shall specially inquire and report as to whether any application named in such request interferes with the caveat, and said person shall be entitled to be certified as to whether the examiner considers there is any inteference or not.

Every caveat shall distinctly state the features of the invention it relates to, and clearly intimate the means whereby such invention can be put in practical operation.

When under an opposition in pursuance of a caveat, it is shown that the application opposed is not made by an applicant who is a true and first inventor, no patent shall be granted upon such application; and in any case of doubt no patent shall be granted except jointly to the party entering caveat and the opposed applicant.

If, after the entry of a caveat, a person entering same presents, during the course of the proceedings and before the law officer's report has been made, an application for a patent for the same invention as is covered by his caveat, then the said application and such application by person entering a caveat shall be treated and adjudicated upon as if made on one and the same day.

A caveat shall not be published, nor shall it be open to public inspection.

The schedule for the stamp duties should have added to it: For certificate of entry of caveat, one pound; or, for certificate of entry of application, one pound; and it is suggested that all the stamp duties be reduced one half.

5th paragraph:—It is thought that rendering all documents accessible to the public ought to be sufficient. It might unduly prejudice a patentee if adverse reports, although over-ruled, were allowed to be paraded about.

Clause 14.—A notice to proceed *after* the report has been made is a useless and cumbrous formality, only serving to keep up high fees.

Clause 17.—1st paragraph:—The causing a lapse by reason of a warrant being more than three months old when application is made to seal the patent is only a stumbling block in the way of inventors, merely affording another legal grievance to inventors.

2nd paragraph:—To oblige every applicant for a patent to wait till the seven days before the expiration of provisional protection is completed will be very objectionable to some persons who have arrangements with capitalists for at once bringing their inventions into the market, and the proposed amendment will enable the patent to be sealed at an earlier date, provided no prior applicant is likely to be prejudiced.

NOTE.—(The amendment of clause 22) now gives such large powers of amendment and addition, that all that is required is to strike out the words "otherwise than by way of supplement," which leaves the right to add the supplement to be disputed after it has been granted.

Clause 27.—*There are so many and grave difficulties to be met in providing for forfeiture of patent for non-working and of compulsory licenses*, and the evils supposed to require to be cured in practice so seldom to be met with, that nothing can satisfactorily be done but strike out this clause.

Clause 49.—The compulsory deposit of models would put patentees to very serious expense; models sometimes cost one hundred pounds, and even larger sums of money.

It is a farcical system to permit rules to be made, and after they are made and have taken effect for good or for evil, to require them to be submitted to the action of Parliament.

As before explained, the caveat system is absolutely necessary if provisional specifications be not allowed to be filed.

*The * in the opposite column denotes where something will have to be left out if the caveat system be adopted instead of the provisional specification system.*

⁂ An abridged copy of the original Bill will be found in the March No. of the SCIENTIFIC REVIEW, and in the April No. a statement of the amendments, except on clause 22 above referred to.

Reviews.

LIFE OF SIR R. I. MURCHISON.

"Life of Sir Roderick I. Murchison, Bart., K.C.B." By ARCHIBALD GEIKIE, LL.D. 2 vols. Murray.

PROF. GEIKIE states that he found, "in addition to the journals, there existed a vast mass of miscellaneous letters and papers, going back even into the last century," and "a goodly series of closely-written volumes." From all these the "Life" has been mainly constructed, the cementing material having been freely furnished by Murchison's friends and contemporaries, and improved by the intimate relation which existed for several years between the biographer and the subject of his biography. Being convinced that no narrative devoted merely to the personal events of the life of Murchison would be satisfactory, our author therefore, while keeping the story of the man before his readers, gives an outline of the progress of geological science to such an extent as to "show with adequate distinctness what Murchison was, and what he did."

The early days of Murchison, it appears, evinced no aptitude for study, for he tells us, "I could not do the commonest things in geometry, and was a bad arithmetician —a foible which has remained with me." Yet even at this time his uncle could write, "I think he has also talents to make a figure in any profession." Murchison's experience in the army were, except during his six months' service in the Peninsula, of the most uneventful character. Ordinary military life had no charms for him, and according to his own confession, he gave himself up to walking feats, lessons in pugilism, horses, and the other pursuits with which a young military dandy contrives to fill up his time.

In 1815 Mr. Murchison married a young lady who was, to use his own words, "attractive, piquant, clever, highly educated, and about three years my senior." Thus, it is stated, "he came under the influence of a thoughtful, cultivated, and affectionate woman. Quickly and imperceptibly that influence grew, leading him with true womanly tact into a sphere of exertion where his uncommon powers might find full scope. To his wife he owed his fame, as he never failed gratefully to record; but years had to pass before her guidance had accomplished what she had set before her as her aim." After some few years of resort to fox-hunting Murchison sold his hunters, and gradually settled down to science, as the serious business of his life. Giving chemistry a little attention, geology was turned to, and at this point Prof. Geikie refers to the rise and progrêss of geology in Britain, as to which he observes there is no reason why these influences of the day should not mould the whole character of his scientific life. We shall trace in the records of later years how thoroughly they did so. As he started, so he continued up to the end, manifesting throughout his career the permanent sway of the circumstances under which he commenced to be a geologist.

We have not space for further analysis of this book, and must content ourselves by stating that the work is pleasant and instructive for all interested in science.

ACHIEVEMENTS OF GENIUS.

"Men of Genuis and their Achievements; Men of Science and their Triumphs; the Brilliant Prospect open to this Country if 'England to Herself be True.'" A Poem (MS.). By J. MABSON. Sheffield.

THIS poem contains many thoughts that are well worthy of being read and considered, especially at a time like the present, when the position of men of inventive genius is before the Legislature. It contains, however, some sentiments not at all to our taste, being withal unsuited to our columns from partaking too much of a political character, and politics having so many journals devoted thereto, it is quite unnecessary we should devote any portion of our limited space to it.

We present our readers with a taste of Mr. Mabson's muse:—

Man, in his rude and savage state,
Without the sense to cultivate
The finest lands, and make them yield
Rich harvest on his hunting field,
Is but a beast of prey. His aim
'S to catch, then gorge himself with game;
To live in this barbaric way
Man must to man become a prey.
Then those who highly civilize
May be accounted truly wise.
O science, like the sun arise!
Reveal to us with wondering eyes
The secret powers that round us lie,
That we our strength may multiply
And give the world a brighter face,
And make it yet a happy place.

As bearing upon the present position of the inventor with the threatened confiscatory action of the Lord Chancellor's Patent Law Bill hanging over his head, we give the following:—

Short-sighted is that policy
That checks man's ingenuity,
Which has conferred by force of mind
Such boundless blessings on mankind.
On best authority we're told
One hundred million pounds in gold
Each year is saved within the States,
By the machine which agitates
The needle pointed at the eye,
And this too in the factory,
Not counting what's in private hands
This gain to man's invention stands.
England's expenditure it is
About, they say, three-fourths of this;
So our Disraeli he was right
When he pronounced it "a flea-bite."
This gain, if won by Mr. Lowe,
Would make him smile, if not to crow;
Then Lucifer, we know this much,
Who burnt him once he would not touch.

Mr. Mabson seeks to publish his thoughts in their expanded form; will anyone help him to do so?

IRON AND STEEL.

The first paper read at the eighteenth ordinary meeting of the session 1874-5 at the Institute of Civil Engineers was on "The Manufacture of Steel," by Mr. Wm. Hackney, B.Sc., Assoc. Inst. C.E., which was in substance as follows:—

Within the last twenty years the meaning of the term steel had undergone a great change. Dictionaries defined it as iron containing a small proportion of carbon, and Dr. Percy repeated the same definition, giving 0·5 to 0·65 per cent. of carbon as the limit at which iron passed into steel. Such a material was not, however, what was meant by steel boiler-plate or a steel rail. The steel of a boiler-plate contained less carbon than many samples of wrought iron, and was equally soft and ductile. The difference between it and wrought iron was, that it had been melted and cast into a malleable ingot. This new use of the term steel had grown out of the increase, of late years, in the production of cast steel of all kinds, almost to the exclusion of other varieties of highly carburetted malleable iron.

Steel might then be defined as any variety of iron cast into a malleable ingot; and the two parallel series, the irons and the steels, might be classified as follows:—

Per centage of Carbon.—0 to 0·2, 0·2 to 0·35, 0·35 to 0·55, 0·55 to 1·50 or more.

Series of the Irons.—Ordinary irons. Granular irons. Steely irons, or soft puddled steels. Hard puddled steels. Cemented steels. Styrian steel.

Series of the Steels.—Extra soft steels. Soft steels. Half-soft steels. Hard steels.

Steel was made by producing a melted alloy of iron, containing a smaller proportion of carbon or other hardening elements than cast-iron.

Practical steel-making processes were of three kinds:

(*a.*) Fusion in crucibles, producing crucible steel.

(*b.*) Blowing air through melted cast-iron producing Bessemer steel.

(*c.*) Fusion on the open hearth of a reverberatory furnace, producing Siemens or Siemens-Martin steel.

Fusion in crucibles was the simplest and oldest mode of making steel, and had been practised by the Hindoos from a remote period. In the Hindoo process, wrought iron was melted in small crucibles, with 1-10th of its weight of dried wood, producing a very hard steel, with upwards of 1·6th per cent. of carbon.

It did not appear that any mode of making true steel was known in Europe before the last century. Reaumur announced, in 1722, that he had made steel by melting together from ¼ to ⅓ of malleable iron, with cast-iron, in a common forge; and Huntsman, between 1750 and 1770, succeeded in making steel by melting cemented or converted bar iron. Since Huntsman's time the processes of crucible steel-melting had been improved only in points of detail, and by the trial or practical adoption of all the different materials for melting that an advancing knowledge of chemistry had suggested as capable of producing steel. Malleable iron was melted by itself if it was of the hardness needed to produce the required quality of steel, or it was mixed with carbon or cast-iron, if too soft, or with oxide of iron or of manganese, if too hard; and spongy reduced iron, or iron ore, was melted with carbon or with cast-iron.

The two principal types of modern pot-steel furnaces were the pot-hole, fired with coke, and the regenerative gas furnace.

Each coke hole held two crucibles, and was a simple rectangular chamber, open above, and communicating near the top with a large main chimney flue. The tops of the furnaces were level with the floor of the shop, and the grates were accessible from the cave below. The pots lasted three rounds, and held from 50 to 70 lbs. the first round, and from 5 to 10 lbs. less each time they were charged. The consumption of fuel was about 3 tons of coke, equivalent to 4½ or 5 tons of coal, per ton of steel melted.

The regenerative gas furnace, for crucible steel melting, was a long trench, divided by cross walls into two, three, or four sections, each holding six pots. The pots rested on a bed of coke-dust, spread over the bottom of the melting chamber. The saving of fuel effected by the gas furnace was very great, 30 cwt. of small coal, per ton of steel, doing the work that on the other plan required 3 tons of coke.

Pot steel was looked on as the highest quality for all purposes. To some extent this was the result of habit, as pot steel was the oldest and best known variety; but it had also two advantages over other qualities —first, it was or might be made of purer materials, as the metal was originally brought into the state of malleable iron, and this was a process of purification, removing the greater part or the whole of the sulphur and phosphorus; and, secondly, it was generally more "dead melted"—the ingots cast from it were more free from honeycomb—than those of the same quality made in any other way.

The Bessemer process, that of blowing air through melted cast iron, produced by far the largest quantity of steel now made. The temperature of the cast iron was raised, rapidly, by the combustion of the accompanying silicon, manganese, and carbon; and the blowing was either stopped when steel of the required hardness had been produced, or it was continued until nearly the whole of the carbon had been removed, and carbon and manganese were then restored to the metal by adding spiegeleisen. The former plan was only applicable where the cast iron employed contained so much manganese that 0·1 or to 0·3 per cent. remained in the steel, as without this proportion of manganese the metal was not forgeable; and it was thus confined to

Sweden and Germany, as few varieties of English, French, or American pig iron contained manganese in sensible quantity. The Bessemer blow lasted from five or six minutes to twenty, thirty, or more, and the heat attained depended on the quickness of the blow, the quantity of metal treated at one time, and its chemical composition. The constituents, whose proportions affected the heat developed, were silicon, manganese, and carbon, more particularly silicon and manganese. The loss of weight in the process varied from 9 per cent. to 15 per cent. or more. The out-put of a pair of 5-ton converters had been increased, by improvements in the mode of effecting their repair so as to keep them more constantly at work, from six heats in twenty-four hours, or thirty heats producing 150 tons a week, up to a possible make of forty-five to fifty heats in twenty-four hours, or in a week of ten turns above 1,100 tons of ingots.

The process of melting steel on the open hearth had long been a favourite dream of inventors; but it was not until the regenerative gas furnace gave the ready command of a sufficiently high temperature that any open-hearth steel-making process became a practical success. Two principal types of open-hearth melting furnaces were now in use: the ordinary furnace, with a fixed bed, and the Pernot furnace. The Pernot furnace differed from the common form, in having the bed circular, and arranged so that it might be rotated on an axis inclined at an angle of 5° or 6° to the vertical. The effect of this rotation was that every part of the bed, and all unmelted pieces of steel or iron, were alternately exposed to the full heat of the flame and dipped into the liquid bath.

The open-hearth steel-making processes might be grouped as:—(*a.*) The Siemens-Martin or scrap process; (*b.*) The Siemens or pig iron process.

In the Siemens-Martin process, as generally carried out, a bath of melted pig iron was first formed on the bed of the furnace, and iron or steel scrap was gradually added until a sample quenched in water was found to be sufficiently soft. An amount of from 6 to 9 per cent. of spiegeleisen was then added, and as soon as this was melted, the charge was tapped out. The time taken to work a 5-ton or a 6-ton charge was from nine to eleven hours; 65 to 70 tons of ingots per furnace being a fair week's work. The loss was 4 or 5 per cent., and the coal used was 13 or 14 cwt. per ton of steel made.

In the Siemens process 5 tons of pig iron were charged on the bed of the furnace, and, when melted, iron ore was added until the metal was nearly soft enough for spiegel; 20 to 24 cwt. of ore were required for a 5 ton charge, and of the metal contained in the ore about one-half passed into the steel, so that the yield of ingots and scrap was generally 1 or 2 per cent. more than the weight of pig iron and spiegel put in. The weekly make of a furnace was about the same as in working scrap, and the consumption of coal was 14 to 15 cwt. per ton.

The working of the Pernot furnace differed in many points from that of the fixed furnace. In melting pig iron and scrap, the pig was first charged over the bed, and the scrap upon it. The fusion was very rapid—five charges, of 4½ tons each, being made in twenty-four hours; and as the coal used was no greater in quantity per day than in a fixed furnace, it was less than half as much per ton. At Allevard, pig iron alone was worked, and a 5-ton charge, with the addition of 7 to 8 per cent. of hammer scale, was brought to the condition of steel in five hours.

Another method of open-hearth steel making was that of Mr. Blair, of Pittsburg, U.S.A.; the reduction of iron ore to sponge, and the fusion of this on the open hearth. For localities where charcoal and rich pure ore were at hand, this method seemed likely to have an important future, but it was as yet on trial.

The effect of different proportions of foreign substances on steel was a subject of great importance. The elements whose presence was known to have an influence on the properties of the metal were carbon, silicon and phosphorus, sulphur and manganese, copper, tungsten, and possibly titanium and chromium. The effect of the presence of carbon had long been recognised. The necessity for manganese in steel, to prevent red-shortness, was less generally acknowledged. A common belief was that red-shortness was due, at least in the case of Bessemer steel, to the presence of oxygen. Bessemer steel impregnated with 0·1 per cent. of carbon, or less, no doubt contained oxygen, but it was at the same time free from manganese; and it was impossible to say to which condition the effect might be due. Harder steel, however, was equally red-short, if it was free from manganese, and there was no reason to believe that such metal contained oxygen. The percentage of manganese required was dependent on the amount of sulphur in the metal. Steel for rails, with less than 0·04 per cent. of sulphur, did not hammer satisfactorily if the proportion of manganese was less than 0·2 per cent.; if it contained 0·08 per cent. of sulphur, it should have at least 0·3 per cent. of manganese; and with as much as 0·12 per cent. of sulphur it would hammer, if it contained not less than 0·4 per cent. There was no evidence that sulphur was removed in any process of steel making.

The red-shortness of steel, which was diminished or prevented by manganese, must be distinguished from the tendency of the metal to give off bubbles of gas at the moment of setting, so that the ingot was spongy or honeycombed. Both were forms of unsoundness, and either greatly diminished or destroyed the value of the metal; but in other respects they were essentially different. Silicon was capable of replacing carbon, to a great extent, as a hardening element, but the hardness produced by it was coupled with more brittleness than that due to carbon; and its presence in a proportion exceeding 0·1 and 0·2 per cent. in steel for rails was looked on as unsafe.

Phosphorus, like silicon, hardened steel and rendered it brittle, but it was much more injurious, and more difficult to remove from the metal, if present in the ore. Malleable iron, practically free from phosphorus, might, however, be obtained from impure pig iron by puddling it thoroughly, and at a high heat, as had been done by Mr. Crampton; or from impure ore by heating it directly in admixture with coal by Dr. Siemens' process. A third mode of obtaining wrought iron free from phosphorus was that of Mr. Henderson—the action of fluor spar on the melted metal in the puddling furnace. The proportion of phosphorus that might be combined with steel, without the latter becoming sensibly brittle, depended on the percentage of carbon and silicon. The best steel contained little or no phosphorus, not more than 0·01 or 0·02 per cent.; but steel containing much more than this might be good enough for ordinary purposes, if the percentage of carbon was diminished as that of phosphorus became greater; until, when the carbon was kept down to 0·16 per cent., steel containing 0·3 per cent. of phosphorus would yet make serviceable rails, and that containing 0·15 per cent. would make excellent tough boiler-plates, which might be bent double when cold, after being heated to redness and quenched in water. In using materials not very free from sulphur, an amount of at least 0·3 or 0·4 per cent. of manganese was required in the steel to make it forgeable, and this could only be incorporated, without raising the percentage of carbon above 0·15 or 0·18 per cent., by adding ferromanganese, an alloy of iron, manganese, and carbon, containing 40 to 60 per cent. of manganese. Such an alloy was now regularly manufactured at Terre Noire, and its production at a low price would be the greatest advance in the manufacture of steel that could be reasonably looked for, as rendering it possible to make good serviceable steel from inferior materials. The other elements believed to affect the properties of steel were of minor importance.

In making steel rails, there was much difference of opinion on the question, whether it was better to hammer the ingot down into a bloom, or to cog or roll it direct. The objection to cogging was, that the rolls tore the metal, but many engineers maintained that they did not. The difference was probably, to a great extent, due to the varying conditions under which cogging was done. If the cogging rolls were of small diameter, and had too much draft, and it was attempted to reduce the ingot too much in size at each pass, the tendency to tear the metal was very great; but if the rolls were large, and the reduction in size attempted in each of the first two or three passes was small, the tendency to tear was slight. The forms of mill generally used for rolling steel rails were the 2-high reversing mill, the English and American arrangements of 3-high mill, the 4-high mill, and Brown's mill. In each the object was the same, to increase the rapidity of working, so as to get a greater output, and to roll each rail more quickly, that it might not have time to get cool and hard before it was finished. For rolling plates, Lauth's 3-high mill was coming much into use. In this, the middle roll was of small diameter and ran loose, being driven only by the friction of the large roll against which it bore.

The knowledge of the relative properties of varieties of steel of different chemical composition, and of the effect of different modes of treatment, was much less exact than might be supposed from the number of experiments that had been made. The majority of these only showed that a certain bar of metal possessed certain properties. There was rarely an analysis of the steel tested, or a statement of its physical condition. An interesting point, lately brought forward, was the effect of quenching in water on the very soft steel used for boiler-plates. Plates of this steel were stiffened, and their tensile strength increased, by sudden cooling; but at the same time the metal was much toughened, so that a piece of it treated in this way might be bent up more closely, without cracking, than in its untoughened condition. This result was in harmony with what had long been known, as to the extent to which somewhat harder steel was toughened, by cooling it, rather less rapidly, in oil.

An important characteristic of steel was the greater extent to which its strength was diminished, than was that of wrought iron, by notches, holes, or other irregularities of form, causing a sudden variation in the section of a part under strain. This difference was especially important as affecting the strength of steel rails, and the extent to which they were weakened by punching and notching. The present practice was to sacrifice extreme hardness and durability in rails in favour of safety; rails were made of almost the toughest metal obtainable; and then their strength was reduced to one-tenth or one-twentieth of its normal amount by notches and holes cut in them.

The second paper read was:—"On Bessemer Steel Rails," by Mr. Josiah Timmis Smith, M. Inst. C.E.

The object of this paper was to endeavour, briefly, to show that, with care in manipulation and in selection of materials, Bessemer steel might be produced constant in quality, and that certain inexpensive tests might be applied which would absolutely determine the quality of the material, in most if not all of its characters, so far as was required for railway and structural purposes.

After an extensive experience in the

manufacture of Bessemer steel rails, the author could only come to the conclusion that the present system of inspection was highly unsatisfactory, and that, whilst it sacrificed a great number of rails, it gave anything but reliable results. The object appeared to be to test each individual rail in such a manner that its value should not be deteriorated. With this view many experiments had been made; and it was hoped that a system had been developed, which, although primarily adapted for rails, might be made available for any other form of steel. The experiments appeared to prove that, if it was possible to determine the hardness of the material, all the other properties might be calculated therefrom. If, therefore, the fish-plate holes in the rails were punched by a registering punching press, an index was obtained for the real quality of the steel. Experiments had shown that this force increased according to the thickness of the metal, in strictly arithmetical progression; for a hole 7-8th inch in diameter the force required was about 8 tons per 1-8th inch.

Experiments had demonstrated that the zone of metal injured, by punching steel having a tensile strength up to 32 tons, did not exceed 3-32 inch in breadth, and that if the fish-plate holes were first made with a small punch and then enlarged, by drilling to the required size, the steel was not more injured than if the hole had been drilled only. The Barrow Steel Company had shipped to Canada more than 100,000 tons of rail treated in this manner; and as there had been no case, to their knowledge, where rails had broken through the fish-plate holes, they considered it a satisfactory proof that no danger need be feared. On the contrary, this mode of punching was one of the best practical tests of the quality of the steel; as, however hard (unless in an exceptional degree) it might be, the particular rails, if drilled, might be overlooked by the management; whilst if the steel had a greater tensile strength than 34 tons to 35 tons, the punch would break, when the rail would necessarily be rejected.

The results of experiments on rails, for the Furness Railway, also proved, that the punching strain was a true index of the steel as to its carbon percentage, tensile resistance, ductility, and the force required to give a permanent set. A fresh series of experiments on rails, which had been in use for several years on the same line of railway, proved that, contrary to what might have been anticipated, greater hardness had not conduced to the longevity of the rails, and that the softer ones showed the minimum of wear.

To sum up the experiments on Bessemer steel rails, it might be stated generally that the most lengthened wear, under the heaviest traffic, did not appear in the slightest degree to deteriorate any portion of the rail, except the wearing surface to an inconsiderable depth. But this part of the rail, however hard and capable of resisting impact, lost almost the whole of its ductility, which was apparently due to the extreme molecular tension of the particles of the metal. If a worn double-headed rail was turned, though the new wearing table would be as strong as when first made, yet the total strength of the rail was materially lessened by the weak under-table, by which much of the elasticity of the rail was destroyed; though, by planing off a thin section, this, as had been demonstrated by experiment, could be entirely restored, allowing for a proportionate decrease in the weight of metal.

PEERS AND PATENTEES.

Under the above heading the *Pall Mall Gazette* recently published a most noteworthy article, being an able *expose* of the patent question as opposed to the views enunciated in the House of Lords by Lord Selborne, Lord Hatherley, Lord Granville, the Duke of Somerset, and other peers in this article. Lord Granville's remarks, antagonistic to a right of property in invention, are thus met:—

Lord Granville asserts, it is impossible to limit a man's right in property. Either an author's property in his work is no property at all, or the several Copyright Acts from Queen Anne to Queen Victoria have achieved an impossibility. But, so far from its being impossible to limit a man's right in property, there is scarcely any kind of property in which men's rights are not limited. Take an extreme case, a man's right of property in land for example. A landowner's powers of settlement are distinctly limited, for he cannot settle his estate, however much he may wish it, except pending lives already existent and for twenty-one years afterwards. Moreover, under the Lands Clauses Act, he can be compelled to sell as much of his land as may be required against his will, and he is not permitted to fix his own price for it. The opponents of patent right seemed to have overlooked the proposition that property under all its aspects is simply a bundle of capacities created by the law, which may be varied and restricted precisely as the Legislature thinks proper. Thus, although the Patent Laws limit the duration of property in patented inventions, and the Copyright Acts limit the duration of property in literary compositions to a longer or shorter period, the proprietary character of the patentee, or the author, or their representatives, is no more affected by this circumstance than the proprietary character of the landowner is affected by the law against perpetuities and the Lands Clauses Act. Lord Granville referred admiringly to Lord Selborne's well-known remonstrance against "property in ideas," in which his lordship replied, with much vigour and metaphysical subtlety, to an argument which had never been advanced by the advocates of the Patent Laws. No one that we know of has ever claimed any "property in ideas." What the inventor does claim, and justly claims, is that he shall be protected in the enjoyment of the fruits of his own ingenuity, industry, and outlay, as far as public policy permits, like other people. Considered from a moral point of view, the positions of the inventor and author are precisely the same. Until their conceptions are embodied in some definite form, it is impracticable for them to assert any proprietary rights over them. But when they take the shape of a book, a machine, or a process, the writer or discoverer is as much entitled to what benefit is to be derived from them as a tailor is to the benefit to be derived from the coat he has made, or a farmer is to the benefit to be derived from the produce of his fields. Lord Granville seeks to draw a distinction between the claims of authors and inventors, not indeed in their nature but in their effects. It is true, he says, that no one may republish another man's book, but "there is not an idea nor an argument in it that any other writer may not adopt and make use of in his own writings." Still it is notorious that if this were carried on to an extent which interfered with the sale of the original work, it would be open to the author to recover damages from or obtain an injunction against the pirate. Besides, the "ideas" and "arguments" would probably be couched in different words from those in which they were originally clothed, and a difference similar in degree to this would sufficiently secure an improver from penalties for the infringement of existing patents. It is an error to imagine that there is a greater tendency among independent inventions designed for a common purpose towards identity than there is among books treating of a common subject. What has been done of late years for the improvement of arms of precision very strikingly illustrates this. There are, of course, certain elements of likeness between the Chassepot, Snider, and Martini-Henry rifles, and the Armstrong, Rodman, and Krupp guns. But they are as easily distinguished from one another as Macaulay's, Hume's, and Lingard's histories of England.

It is not, however, solely on abstract ground, or even in the interests of the public, that the repeal of the Patent Laws is threatened. Inventors themselves are, it appears, the main objects of solicitude. They are benefactors to the human race, more so than "warriors, poets, or artists," and they suffer from the Patent Laws as a class "in consequence of the monopoly which it gives to articles which have been patented." We confess that we do not quite understand what this means. It means, perhaps, that the accident of time, and occasionally a very short time, may secure a patent to one rather than to another equally original inventor. This is no doubt unfortunate, but it is inevitable in our present imperfect condition. Precisely the same accident has seated Lord Granville in the House of Lords instead of his younger brother, who has certainly as much reason to complain as an inventor who happens to have been anticipated by somebody else. But it seems also that "not one patented invention in a hundred has the least chance of success," and many patents under the present system are unremunerative; they do not compensate the inventor for his loss of time and money. In these objections to the Patent Laws we see some of their most eminent advantages. It is impossible to tell with any certainty whether an invention will or will not succeed until it has been tried. If Lord Granville is prepared to affirm that benefactors to the human race, superior to "warriors, poets, and artists," are deserving of no reward for the advantages they have conferred on their kind, the position, however flagrantly unjust, is, at any rate, intelligible. But if he admits, as common equity suggests, that they are deserving of reward, then it seems to us that such reward should be proportioned as far as practicable to merit. It is for this, among other reasons, that Mr. Mill, in his "Principles of Political Economy," supports the Patent Laws, and censures the efforts of those who would abolish them, which efforts, he observes, "if practically successful, would enthrone free stealing under the prostituted name of free trade." In his view, an exclusive privilege of limited duration is preferable to other means of rewarding inventors, "because it leaves nothing to any one's discretion, because the reward conferred by it depends upon the invention's being found useful, and the greater the usefulness the greater the reward, and because it is paid by the very persons to whom the service is rendered, the consumers of the commodity." We assume that Lord Granville's tirade about the working man and "the spirit of gambling" was intended to be serious. But it would have been more appropriately used early in the fifteenth than late in the nineteenth century. It is conceived quite in the humour of the statute of labourers and the sumptuary laws. It may be true that some working men waste their time in visionary schemes of invention; but, like Arkwright, the barber, they sometimes succeed, and they are, as a rule, quite capable of taking care of themselves. Besides, we will venture to say that even when success is not achieved, the mere prosecution of their inquiries is an improving and elevating occupation compared to the monotonous and mechanical round of labour which is assigned to them as their normal sphere of activity.

We shall not follow Lord Granville into his observation on the experience of Holland and Switzerland in the absence of Patent Laws. What Holland has done in the way of invention in recent times we have yet to learn, and Switzerland, according to the authority quoted, seems chiefly remarkable for borrowing inventions originated in other countries where Patent Laws are in force. We cannot to-day enter upon the general considerations which in our opinion not only justify the Patent Laws, but render them imperatively necessary. On the present occasion we have merely endeavoured to expose the more glaring fallacies of which Lord Granville has constituted himself the patron, and we shall postpone the examination of the larger question to some future opportunity.

We may add that we trust this promise will be shortly fulfilled.

THE ARTIZANS AND THE NEW PATENT BILL.

Memorial of the Artizans and Inventors' Committee.

1. THAT your memorialists are artizans and inventors, and persons professionally and commercially engaged in devising and practically applying new inventions; and, therefore, directly interested in the commercial and industrial prosperity of the United Kingdom.

2. That your memorialists have learnt that a Bill is now before Parliament, entitled a Bill for Consolidating, with Amendments, the Acts Relating to Letters Patent for Inventions; and are deeply concerned to find that, although such Bill bears evidence of an attempt to do justice to the interests of the inventor and the public, yet it contains many provisions which, while they must prove highly injurious to artizans and inventors of small pecuniary means, as tending to debar them from obtaining any material benefit from the efforts of their ingenuity, will be most detrimental to the public welfare, as such provisions will in various ways discourage the improvement of our useful arts and manufactures.

3. The objectionable provisions in the said Bill are the following:—

(a.) *The requirement of the deposit of the full specification as the very first step* in obtaining protection for an invention, the effect of which will be, that until an invention is complete in all its details, no protection will be obtainable, nor advice nor assistance to be had in regard thereto, without jeopardy; which requirement will also entail on the inventor the payment at the very outset (subject to the chance of loss if the application be rejected) of a considerable sum of money for costs of specification; matters of very great importance not usually effected without the employment of professional assistance, unobtainable except at some considerable expense.

(b.) AN EXAMINATION before the grant of letters patent, which will be highly objectionable, inasmuch as it will form the groundwork for rejecting an application for a patent "by reason of the frivolous character of the invention rendering it not worthy of a patent," a matter, it is most respectfully submitted, no man, nor any set of men, can with any certainty be capable of deciding; as what may appear to be frivolous to one person will seem of importance to another; and, moreover, as this proposed examination is to take place before the invention has been practically tested in the workshop, or in actual industrial use, the decision must necessarily be arrived at upon very insufficient data.

It is desirable that there should be an inquiry into *novelty* previous to the issue of letters patent, based upon the examination of prior specifications of patents, public documents, and publications, or upon sufficient evidence offered by legitimate opponents. But the extension as proposed of such inquiry beyond novelty cannot prove otherwise than absolutely mischievous, as discouraging inventors, and therefore injuring the public.

(c.) The provisions of the said Bill for *shortening some patents to seven years'* duration; in the vast majority of cases fourteen years being, as experience testifies, not too long. It is, however, respectfully submitted that if it be considered desirable, to meet the case of minor inventions, such as some of those now registered under the Utility Designs Act, to allow short patents for seven years to be taken (with the chance of renewal if the proper authority allows same); this might be effected by offering the option of sueing out such short patents at one half the stamp duties at each and every stage, beginning with the application which would induce very many inventors to apply for the shorter term of patent.

(d.) The provisions as to forfeiture of patent *for non-working of the invention within two years* from its date, and as to *compulsory licences*, your memorialists view as very mischievous, and can conceive of no possible excuse for such enactments, except, perhaps, as applicable to cases where a patentee is proved to be abusing or misusing his patent rights and privileges, and they submit that such cases are so rare that they are practically no evil.

4. Further, it is most respectfully submitted that the Bill requires amendment in its provisions generally, and especially as regards the power given to the Commissioners to make rules "prescribing and regulating (*inter alia*) the deposit of models in such cases as they think fit," as this would enable the Commissioners to call for models whenever they please, and thus entail a heavy burden on inventors, accurate models not unfrequently entailing the cost of one hundred pounds, or even larger sums of money. Therefore the deposit of models should not be compulsory in any case.

5. Your memorialists desire to express their great surprise and regret at finding the Bill does not practically reduce the Government charge for a patent, which is what is greatly needed by artizans and inventors of small pecuniary means, who constitute the great majority of the inventors of this country, and who have for years past been complaining of the high scale of stamp duties imposed on patents in the United Kingdom; and if the Bill now before Parliament is not so altered as to allow provisional protection on deposit of a provisional specification for a sum of money not greater than £1, as would be preferable, the first step to protection of an inventor should at all events be very cheap, and it is suggested that this might be provided for by allowing (as in the United States of America) a caveat, accompanied by a descriptive declaration of the invention, to be entered, and which should, for £1, for three months at least, prevent the grant of patent (without previous notice to the person entering the caveat), and proper adjudication thereon, on any patent passing for a given subject.

6. It is also most respectfully submitted in regard to the Government dues on letters patent that there is no valid reason whatever why the cost of securing the right to obtain remuneration for devising and developing an invention should amount to many pounds, whilst the right to remuneration for literary work under the Copyright Acts does not amount to many shillings. Copyright, moreover, unlike patent-right, not being limited to fourteen years, but extending to forty-two years certain, and even exceeding that term in case the author lives longer. And as artizans and workers, on behalf of industrial progress, your memorialists feel that an injustice is done them by heavily mulcting them, because their brain work relates to our industrial progress, which would not be the case if it related to our artistic progress or literary work, and the Bill ought to be amended, so that all stamp duties be much smaller in amount, especially the stamp duty payable at the first stage.

ASA JOHNSON'S IMPROVED MACHINE FOR CORRUGATING AND MOULDING SHEET METAL.

THIS machine was patented, in the United States, February, 8, 1870, and patented in Great Britain, May, 8, 1870, by the inventor, Asa Johnson, and Wm. T. Still, both of Brooklyn, New York, and who are now the owners of said patent in Great Britain, and are desirous of introducing it there.

There is it appears, at the present time, one of these machines in successful operation in the City of New York, where it can be seen at any time.

The machine is composed of two rollers, placed one above the other, in a suitable frame, in front of which a feed table is attached, for the purpose of receiving the sheets of metal and carrying them forward to the rollers at the proper instant.

The rollers are geared together by means of gear wheels, so that motion being communicated to either one said rollers, both of them will revolve in the proper direction.

The rollers may be made either hollow or solid, with one or more different kinds of teeth, or projections, or may be made in sections, and grooved.

These teeth, or projections, are made as follow:—The portions of the rollers that form the oval part of the mouldings:—one roller is made with projections to correspond with the same projections forming the mouldings which are to be formed on the metal, and are matched with corresponding depressions in the other roller, while all the other portions of the rollers that form the straight lines and smooth surfaces, as well as the projections on the gear wheels, &c., are formed on the same curve as the pitch line of the wheels, or rollers, on which they are formed. By using the sectional rollers grooved, as above described, it is possible, by taking off one section and putting on another, to do all kinds of work with two rollers, that ever has been, or can be, done with dies, and do it better and a great deal faster.

The machine which is now in operation in the city of New York, corrugates it is stated three sheets of metal, and three different kinds of corrugations, or mouldings, every revolution of the rollers. Therefore, any person may judge how fast it works, and by seeing it work they will be satisfied it does the most perfect work.

The same patent also covers all gear wheels, everything that rolls together in that way, making a perfectly noiseless gear. The wheels do not make any more noise, run as smoothly, and bear equally together, at all points, as two round rollers of the same size.

CHEAP LIGHT.

A NUMEROUS and influential gathering of scientific men and others interested in social progress assembled in the large hall of the Shaftesbury Estate, near Wandsworth, under the presidency of the Chairman of the Society of Arts (Major-General F. Eardley-Wilmot, R.A., F.R.S.), when a paper on "Oil *versus* Gas" was read by Mr. Burr Heath, who affirmed that gas is a dear, dirty, and dangerous nuisance, which benefits the vendor rather than the consumer, who has really no control over the quality or supply of that which he pays for. It was argued that, by the adoption of mineral oil as burnt in the Paragon Lamps of Messrs. Dietz and Co., of Carter-lane, London (who conducted the experiments), every consumer can save nearly half his lighting expenses, and keep the regulation of his arrangements under personal control, without being compelled to pay just what the gas companies like to charge. Besides this, as 9,000,000 tons of coal are annually used for making gas, if that quantity were not withdrawn from the market, it would tend to lessen the price of fuel, with consequent advantages to the manufacturer who uses steam power.

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THE INVENTORS' INSTITUTE,

4, ST. MARTIN'S PLACE, TRAFALGAR SQUARE, LONDON.
ESTABLISHED 1ST MAY, 1862.

Past Presidents:

SIR DAVID BREWSTER, K.H., LL.D., F.R.S., &c., from the establishment of the INVENTORS' INSTITUTE, till his decease, February, 1868. LORD RICHARD GROSVENOR, M.P.

President of Council:

SIR ANTONIO BRADY.

MEMBERS MEETINGS AT 8 P.M.

On Thursday, May 6th, Conference on Patent Laws.

Council and Executive Meeting on the same Evening at 7 p.m.

On Thursday, May 20th, Annual General Meeting, at 4 o'clock in the afternoon.

Subscriptions are payable to Mr. G. A. STRETTON, the Receiver, 4, St. Martin's-place, S.W., who is the proper official to give receipts.
F. W. CAMPIN, Sec.

Proceedings of the Institute.

On 8th April the Council and Executive met, and after the minutes of the last meeting (a specially summoned one) had been read and confirmed as being correctly entered, the Secretary reported that the sub-committee appointed at that meeting for organizing a meeting of all parties interested in patent matters, had had several sittings, and that a circular-letter had been issued to the members of the Institute soliciting special assistance in carrying out that project; but sufficient time had not yet elapsed to have obtained any result.

The sub-committee for preparing the case to be laid before the House of Commons, when the Patent Law Bill came before that branch of the Legislature, was proceeding with its work, and he hoped to be able to report results at the next Council meeting. He might mention that he had been in communication with the Society of Arts; with the committee sitting at the Institution of Civil Engineers; with the Patent Agents, and with a committee of Artizans and Inventors; and all seemed inclined to make the same objections in regard to the Bill that had been urged by the observations he had forwarded to the Lord Chancellor, and published in last month's issue of the SCIENTIFIC REVIEW.

It was decided that it would be desirable to get some Member of Parliament to preside at the next Members' meeting.

On 22nd April, the Council and Executive met, and after the minutes of the last meeting had been read and confirmed as being correctly entered, Sir Antonio Brady, the President of Council, suggested that it would be desirable that, preparatory to any public meeting on the Patent Laws, a Conference should be held of all parties now taking action on the subject; thereupon it was resolved unanimously that the President, having kindly placed his private office at the disposal for such Conference, that it be appointed for Wednesday, 28th April, to be held thereat. Also that, as it appears doubtful whether the Hall of the Society of Arts can be obtained at an early day for holding the public meeting referred to, that the President of Council and the Secretary be empowered in case of difficulty to arrange for such meeting at some other suitable place.

At the Members' meetings on 8th and 22nd April, the business, as announced in our last, was transacted, the latter meeting, presided over by Thomas Brassey, Esq., M.P., was numerously attended. Proceedings will be found elsewhere.

Monthly Notices.

A new crayon Dr. E. Jacobsen is said to have invented, made of methyl-violet, thickened with gum-acacia and mounted in wood like a pencil. The writing with this is at first like black-lead, but when moistened it becomes a bright violet.

As a light for photographic purposes, MM. A. Riche and C. Bardy recommend the flame of sulphur burning in a jet of oxygen. Mr. Spiller, President of the Photographic Society, recommends the light produced by dropping small pieces of sulphur into fused saltpetre.

Mr. G. A. Lebour, of the Geological Survey, has recently communicated to the North of England Institute of Mining and Mechanical Engineers, a paper "On the Coals of the Carboniferous Limestone Series of the North of England," which is of considerable practical interest.

Professor T. Richter has been appointed Director of the Royal Mining Academy at Freiberg, in Saxony. The former Director, Professor Zeuner, is at the head of the Polytechnic at Dresden.

M. Gaston Tissandier, the only one of the three gentlemen who escaped death in the late fatal balloon ascent in France, is the author of a work on the history and practice of photography, a translation of which Messrs. Lowe and Co. are to publish in May.

Marine Engineers' Agency is the title of what promises to be a very useful society for mutual assistance in obtaining employment by marine engineers, and a medium of intercommunication for steam shipowners and engineers, recently established at 14, London-street, City, E.C., with Mr. M. A. Soul as secretary. We hope to hear of the prosperous progress of this promising society.

Experiments on the Physical Properties of Certain Alloys of Silver and Copper have recently been carried out at the Mint by Mr. W. C. Roberts, who has laid the results of his researches before the Royal Society. The molecular mobility of these silver-copper alloys causes their homogeneity to be readily destroyed, producing irregularity of composition. These researches deal with fusibility, electric conductivity, liquation, and density. It is notable that a close similarity has been traced between the curves of fusibility and electric conductivity.

The Sub-Wealden Exploration is at present being carried forward with extraordinary success. It appears that the new boring, which was commenced on Feb. 11th, had, at the end of March, reached a depth of 373 feet. The Diamond Rock-Boring Company thus accomplished in less than seven weeks what had taken a twelvemonth to effect under the old system. Cores seven or eight feet in length are now being extracted. The present area of the bore is 5 1-8th inches. The gypsum beds have been passed through, and the bore is now in the Kimmeridge clay. Mr. Thornton, the engineering superintendent, publishes his diary of the work; and Mr. Rudler contributes an account of the deep boring at Sperenberg, in Prussia.

The Council of the Royal Society have selected fifteen from the fifty-four candidates for the Fellowship, recommending them for election. The names are, W. Archer, M.R.I.A.; J. Risdon Bennet, M.D.; D. Brandis, Ph.D., F.L.S.; J. Caird, C.B.; Prof. J. Casey, LL.D.; A. Dupré, Ph.D., F.C.S.; J. Geikie, F.R.S.E.; J. W. L. Glaisher, M.A.; J. B. N. Hennessey, F.R.A.S.; E. Klein, M.D.; E. Ray Lankester, M.A.; G. S. Nares, Captain R.N.; R. S. Newall, F.R.A.S.; W. C. Roberts, F.C.S.; Major-General Scott, R.E., C.B. Thursday, June the 3rd, is the day appointed for the election. By that time, Captain Nares will be on his way towards the North Pole. When he presents himself for admission after his return, he will, no doubt, have won yet higher claims to the honourable distinction.

Biology is to be the subject of a new series of scientific works to be issued by Mr. Murray. Each work is intended to be complete in itself; and while suited to any reader of ordinary education, is to embody the latest discoveries, and the scientific literature of its subject to be fully referred to, with copious illustrations. The first will be "A Natural History of Mammals, including Man," by Mr. St. George Mivart, F.R.S. The first volume will comprise Man, the Apes, Bats, Beasts of Prey, and Gnawing Quadrupeds. The second volume will contain descriptions of the Hoofed and other Animals not previously described, and it will also treat of the classification and distribution of Mammals, reviewing the facts of their structure in anatomical instead of in zoological order.

Proceedings of Societies.

ROYAL SOCIETY.

MARCH 18TH. — Dr. Hooker, C.B., President, in the chair.—The following papers were read: "The Behaviour of the Hearts of Mollusks under the Influence of Electric Currents," by Dr. M. Foster and Mr. A. G. D. Smith,—"On the Absorption Spectra of Metals Volatized by the Oxyhydrogen Flame," by Messrs. J. N. Lockyer and W. C. Roberts, — and "On the Liquation, Fusibiilty, and Density of certain Alloys of Silver and Copper," by Mr. W. C. Roberts.

April 8th.—Dr. Hooker, C.B., President, in the chair.—The Earl of Carnarvon and the Right Hon. W. E. Forster were elected Fellows P. J. van Beneden, of Louvain; J. L. F. Bertrand, of Paris; A. L. O. Des Cloiszeaux, of Paris; H. L. Fizeau, of Paris; E. M. Fries, of Upsal; J. Janssen, of Paris; A. Kekulé, of Bonn; G. R. Kirchhoff, of Berlin; and C. Ludwig, of Lipzeig; were elected Foreign Members. The following papers were read:—"First Report of the Naturalist attached to the Transit of Venus Expedition to Kerguelen's Land, December, 1874," by the Rev. A. E. Eaton,—and "Experiments to Ascertain the Cause of Stratifications in Electrical Discharges in Vacuo," by Messrs. W. De La Rue, H. W. Müller, and W. Spottiswoode.

April 15th.—Dr. Hooker, C.B., President, in the chair.—The following papers were read: "On the Development of the Teeth of Fishes: Elasmobranchii and Teleostei," by Mr. C. S Tomes, and "Researches upon the Specific Volume of Liquids, I. On the Atomic Value of Phosphorus," by Mr. T. E. Thorpe.

ROYAL INSTITUTION.

APRIL 5TH.—The Duke of Northumberland, President, in the chair.—The Lady Caroline Kerrison, Sir Harry Verney, Bart., Capt. Antony Olivier Tabuteau, the Hon. Sir Colley Harman Scotland; Messrs. W. M. Bywater, C. Elliot, H. W. Müller, F. Peacock, H. C. Stephens, and R. Wheen, jun., were elected Members. The managers reported that they had appointed Mr. A. H. Garrod Fullerian Professor of Physiology.

ZOOLOGICAL SOCIETY.

MARCH 16TH.—Dr. A. Gunther, V. P., in the chair.—The Secretary read a report on the additions made to the Menagerie during February; and various letters and communications were read.

April 6th.—A letter was read from Dr. G. Hartlaub, F.M.Z.S., stating that the finch described by him and Dr. Finsch as new in the Society Proceedings for 1870, p. 817, and named *Lobiospiva notabilis* was probably only the young bird of *Amblyura cyanovirens*. Dr. A. Gunther exhibited the skin of a new species of mole from British Caffraria, which he proposed to call *Chrysochloris trevelyani*. The Secretary exhibited on behalf of Mr. J. Gould, F.R.S., the original specimen of the parrot *(Aprosmictus insignissimus)* spoken of by Mr. Gould in his communication to the society on the 3rd of November, 1874 (P.Z.S., 1874, p. 499), also specimens of two other new species of birds from Northern Queensland, a new honey-eater, proposed to be called *Ptilotis flavostriata*, and a new parrot, proposed to be called *Cyclopsitta maccoyi*. Mr. Osbert Salvin, F.R.S., read a memoir on the avifauna of the Galapagos Archipelago. After a summary of what was known of the history and physical peculiarities of these islands, Mr. Salvin proceeded to give a complete account of the birds as at present known to us from the visits of Mr. Darwin, of the naturalists of the Swedish frigate "Eugenie," and of Dr. Habel, whose collection afforded the principal materials upon which the present communication was based. Of the fifty-seven species of birds known to exist in the Galapagos about two-thirds were stated to be peculiar to the Archipelago. Mr. A. G. Butler, F.Z.S., read a memoir on the Heterocerous Lepidoptera of the family *Sphingidæ*, in which a complete revision of the various genera and species of this family was given. A communication was read from Dr. J. S. Bowerbank entitled "A Monograph of the Sileceo-Fibrous Sponges, Part III.," being the third of a series of memoirs on this class of sponges. A second communication from Dr. Bowerbank contained the seventh part of his contributions to a General History of the Spongiadæ. Mr. A. H. Garrod read a paper on the form of the trachea in the *Tantalus ibis*, in which the peculiar and numerous convolutions of that tube within the thorax of that bird were described. A communication was read from Mr. G. S. Brady, C.M.Z.S., in which he gave a revision of the known species of British Marine Mites, together with descriptions of some new species. Mr. C. A. Wright, C.M.Z.S., read a paper on the question of the specific identity of the weasel found in Malta, which he was inclined to refer to *Mustela boccamela*, Bp., hitherto only known to occur in Sardinia.

THE INSTITUTION OF CIVIL ENGINEERS.

FEBRUARY 23RD.—Mr. T. E. Harrison, President, in the chair.—The following papers were read: "On the Working of Railways," by Mr. G. Findlay, "On Sorting Railway Trains by Gravitation," by Mr. W. Cudworth,—and "On Railway Statistics, 1873-74," by Mr. J. T. Harrison.

At the meeting of this society, on Tuesday, the 6th April, 1875, Mr. Thos. E. Harrison, the President, in the chair, it was announced that the Council, acting under the provisions of the bye-laws, had transfered Mr. Frank Fitzjames, Ex. Engr., P.W.D., India, from the class of Associate to that of Member, and had admitted Messrs. Edward Skelton Bellasis, Robert Birkett, Malcolm Grant-Dalton, Frederico Duboc, William Harding Brehmer Green, Charles Cornwallis Burton Knapp, Henry Hare Manwaring, Harwood Heavisides Simpson, and Charles John Henry Fyler Townsend, as Studeuts of the Institution.

The monthly ballot resulted in the election of twenty-three candidates, viz.:—Messrs. Charles Richardson, Bristol, and Thomas Taylor Smith, Chester-le-street, as Members; and Messrs. Philip Barry, Engineer to the Cork Harbour Commissioners; John Bennett, London and South-Western Railway; William Dugald Campbell, Stud. Inst. C.E., Guildford; Thomas Smerdon Cornish, Southwark-street; William Crabtree, Borough Surveyor of Southport; Thomas Freeman Dowden, Major R.E., Deputy Consulting Engineer for Railways, Bombay; Andrew Greig, Tayport; George Day Harrison, Engineer to the Staffordshire Potteries Waterworks; Charles Frederick Hart, Secretary of the Wilts and Gloucester and other Railway Companies; Edmund Gregory Holtham, District Engineer, Imperial Government Railways of Japan; Emile Jean Godolphe Kern, Resident Engineer of the Poltava Waterworks, Russia; Frederick Stepney Manners, London Manager of the Broughton Copper Company; Joseph Mitchell, jun., Engineer to the Worsboro' Local Board; John Arthur Owen, Stud. Inst. C.E., Trinity House; Edmund Vernon Porter, Westminster; Frederic William Reeves, Tay Bridge Works, Fife; Frank Edward Robinson, Westminster; Charles Smith, Barrow-in-Furness; Walter Hampden Thelwall, Westminster; Francis John Waring, P.W.D., Ceylon; and John Webster, Royal Engineer Department of the War Office, as Associates.

There are now on the books the names o 15 Honorary Members, 820 Members, 1,441 Associates, and 319 Students, together 2,595 of all grades. During the past quarter the changes have included the election of 2 Honorary Members, 11 Members, and 77 Associates; the transfer of 4 Associates to the class of Members, and the admission of 25 Students. On the other hand, from deaths and other causes there have been removed from the list 2 Honorary Members, 3 Members, 6 Associates, and 11 Students, showing a net increase of 93 in the three months.

GEOLOGICAL SOCIETY.

MARCH 24TH.—J. Evans, Esq., President, in the chair.—Messrs. G. B. Hall, J. Foulerton, J. D. Sainter, J. Stubbins, and G. H. Parke, were elected Fellows.—The President announced the bequest of the late Sir Charles Lyell to the Society. The following communications were read:—"On the Occurrence of Phosphates in the Cambrian Rocks," by Mr. H. Hicks,—"Note on the Structure of the Phosphatic Nodules from the Top of the Bala Limestone, in North Wales, by Mr. M. H. Johnson,—"On the Maxillary Bone of a new Dinosaur, *Priodontognaihus Phillipsii*, contained in the Woodwardian Museum of the University of Cambridge," by Mr. H. G. Seeley,—and "Description of a new Species of the genus Hemipatagus, Desor, from the Tertiary Rocks of Victoria, Australia, with Notes on some previously described Species from South Australia," by Mr. R. Etheridge, jun.

April 14th.—J. Evans, Esq., President, in the chair.—Messrs. L. C. Miall, J. Brigg, and H. Davey were elected Fellows; and Dr. T. Kjerulf, of Christiana, a foreign member. The following communications were read:—"Description of New Corals from the Carboniferous Limestone of Scotland," by Mr. J. Thompson; "On the Probable Existence of a Considerable Fault in the Lias near Rugby, and of a new Outlier of the Oolite," and "On a Labyrinthodont from the Coal-Measures," by Mr. J. M. Wilson; and "On *Cruziana semiplicata*," by Mr. J. L. Tupper.

ANTHROPOLOGICAL INSTITUTE.

MARCH 23RD.—Col. A. Lane Fox, President, in the chair. The President communicated a note on the chest measurement of recruits for the army, pointing out how the departure from a uniform method of measuring gave rise to unnecesary public expenditure, and often to the loss of good and sound men to the service. The method employed by Col. Fox himself at his depôt was explained, and a table of statistics was exhibited in illustration of his remarks. The Rev. D. I. Heath, M.A., read a paper, entitled "Molecules and Potential Life." The object of the author was to adduce arguments to show that there is a physical foundation for the measurement of vitality. The labours of Dr. Lionel Beale enabled us to put the amount of protoplasm or living matter in the adult human body at about fifteen pounds in weight. Every vital action of every sort or kind kills a portion of that matter, and the mechanism by which its death is compensated for, by the vitalization of fresh pabulum, was anatomically and physiologically described. Hence it followed that every unit of vital action is at the same time exhibited. The death of protoplasm at the outside of a cell was described as diminishing the velocity, and, therefore, the pressure of the outside dissociated atoms, the consequence of which was the deposit of the proximate principles, such as fibrine, &c., and a rush of fresh pabulum inwards into the cell. Mr. C. H. Kinahan contributed a paper "On a Prehistoric Road at Duncan's Flow, Balbyalbough, Co. Antrim."

April 13th.—Col. A. Lane Fox, president, in the chair.—The following members were announced: — The Hon. Lady Hamilton Gordon, Lady Claud Hamilton, Lady Maud Parry, Messrs. A. G. Phillips, and J. W. Leverdo. A paper was read, by Prof. Rolleston, "On the People of the Long-Barrow Period." Mr. B. F. Hartshorne exhibited and described objects of pre-Hellenic age from Troy. One of these, a spindle whorl of terra cotta, curiously incised, came from a depth of twenty-six feet below the surface of the soil, and therefore belonged to the stratum which represents the "Troy of Homer."

LONDON ANTHROPOLOGICAL SOCIETY.

At the meeting of the society on the 9th inst., Dr. Charnock, F.S.A., President, in the chair, after announcement of the election of twelve new Fellows, Mr. C. O. Groom Napier, F.G.S., read a paper entitled "Where are the Lost Tribes of Israel?" and proceeded to inquire into the various theories put forth to identify the Israelites with existing nations. After showing the merits and demerits of each theory, he followed the line of argument adopted by Wilson, Carpenter, Hine, and other supporters of the "identification," and sought to prove that the British Celts were Israelites who had come to this country with the Phœnicians by sea, and that the Angles and Saxons were descended from the Getœ and Massagetœ, who were, in fact, the ten tribes carried into captivity by the Assyrians; and that, consequently, the greater part of the English speaking populations of the world were Israelites, and, as such, are entitled to the preponderance which they are supposed to enjoy. The author's conclusions were severely criticised by Mr. A. L. Lewis, Mr. C. H. E. Carmichael, and Dr. Carter Blake. The discussion was adjourned for a month.

MICROSCOPICAL SOCIETY.

April 7th.—H. C. Sorby, Esq., President, in the chair.—Mr. A. Allen was elected a Fellow. A paper by the Rev. W. H. Dallinger and Mr. Drysdale was taken as read. It was entitled "Some further Researches upon the Life History of the Monads."

ASTRONOMICAL SOCIETY.

April 9th.—Prof. Adams, President, in the chair.—A paper by Lord Lindsay was read "On Observations for the Determination of the Longitude of his Station on the Way from Mauritius Homeward." A paper by Mr. Wilson was read "On the Relative Motions of the Two Components of 61 *Signi*." He concluded that the observations of this and the last century could not be reconciled on the supposition of uniform rectilinear motions, but that the divergence from rectilinear motion was very small; and that it would be important, in order to determine the orbit and mass of the two stars, that accurate observations of their position, angle, and distance should be made for many years to come. Mr. Raynard read a paper "On an Instrument for giving a Monochromatic Image of a Circular Slit." The instrument was somewhat complicated, and involved the use of a convex parabolic reflector and a convex elliptic reflector, together with two non-achromatic object-glasses. The principle of the instrument was that it greatly increased the distance between the focus of the red and the violet rays as existing in the ordinary non-achromatic object-glass, producing, as one may term it, a dispersion along the axis. The centres of the object-glasses are stopped out, leaving only the outer rims, serving as circular prisms, and the light is then passed backwards and forwards many times, through different parts of the two object-glasses, by reflections at the parabolic and elliptic reflectors; ultimately a small diaphragm or circular slit is placed in the focus of the required ray. Papers were also read by Prof. Caley, "On a Theorem in Elliptic Motion,"—by Mr. Proctor, "On the Use of Photography in the Observations of the Transit of Venus,"—and by Profs. Newcomb and Holden, "On Observations of the Satellites of Saturn made at the Washington Observatory."

PHYSICAL SOCIETY.

March 13th.—Dr. J. H. Gladstone, President, in the chair.—Mr. W. C. Roberts read a paper "On the Electro-Deposition of Iron." He referred to the beautiful specimens of electro iron, the work of the Russian engineer, M. Eugène Klein, which were exhibited at the meeting of the British Association at Exeter. In 1870, Mr. Roberts visited St. Petersburg, and had the advantage of receiving from the late M. de Jacobi, suggestions which enabled him to deposit iron with much success. He stated that a plate of electro iron 150^{mm} square by 2^{mm} thick was desposited on copper by Herr Bockbushmann in 1846. In 1857, Mr. Feuquières exhibited specimens of electro iron at the Paris Exhibition. In 1858, M. Garnier patented in England his process, termed acierage, for protecting the surfaces of engraved copper-plates; and in the same year, Klein produced the admirable works above referred to. The author then exhibited specimens which he had obtained by Klein's method. The bath consists of a double sulphate of iron and magnesia of sp. gr. 1·155; the chief conditions of success being the neutrality of the bath and the employment of a very feeble current. Iron so obtained possesses a higher conductivity than any commercial iron (Matthiessen), its sp. gr. is 8·139, and it occludes thirteen times its volume of hydrogen. A tube of the metal deposited on a rod of wax, which was vacuum tight at the ordinary temperature, allowed hydrogen to pass freely at a dull red heat. After a brief discussion, Prof. Guthrie described some experiments which he has recently made, with the assistance of Mr. R. Cowper, in continuation of former researches, "On Salt in Solutions and Attached Water." The main object of these experiments was to ascertain the manner in which mixtures of salts act as cryogens, and to study their combination with water at various temperatures and in various proportions. When two salts, to which either the acid or the base is common, and which do not form a double salt, are mixed in equivalent proportion, the cryogen produced has nearly the temperature due to the salt, which alone would produce the greatest degree of cold. Solidification begins at a temperature below the melting point of the least fusible, and continues at lower and lower temperatures until the temperature due to the other constituent, salt, is reached. Occasionally a cryohydrate, having a constant solidifying point, has been obtained by mixing in definite proportions salts which are not known to exist in the form of a double salt. In all such cases the solidifying point of the mixture is intermediate between the solidifying points of the constituents and its temperature as a cryogen is also between the temperatures of the constituents when separately used as cryogens. When two salts composed of different acids and bases are mixed and no precipitation occurs, it is generally considered that partial double decomposition takes place, two new salts being formed. It was found that if the salts AX and BY be mixed in atomic proportion, and dissolved in the smallest possible amount of water, a mixture identical with that produced on mixing AY with BX is obtained. The temperature and composition of the resulting cryo-hydrate are the same in both cases. But the temperature never falls as low as the point which could be reached by employing whichever of the salts AX, AY, BX, BY, forms a cryohydrate with the lowest temperature. Thus a saturated solution of a mixture of nitrate of potassium and sulphate of sodium solidifies at -5° C. A mixture of nitrate of sodium and sulphate of potassium also solidifies at this temperature. Since the solidifying point of nitrate of potassium is -17°, this salt cannot exist without partial decomposition taking place in either mixture, for, as has been shown above, its presence would ultimately depress the solidifying point. Dr. Rae remarked that these researches are specially interesting in connection with the salts retained by sea ice. With a view to study this subject, he has already requested captains of whalers visiting the Arctic regions to bring home samples of ice of different age and from various localities.

April 10th.—Prof. G. C. Foster, V.P., in the chair.—Dr. Odling was elected a Member. Prof. H. M'Leod communicated to the society some observations on the defects of the human eye as regards achromatism.

CHEMICAL SOCIETY.

February 18th.—Prof. Odling, President, in the chair. Prof. C. Maxwell delivered his lecture "On the Dynamical Evidence of the Molecular Constitution of Bodies." The lecturer, after some preliminary remarks, proceeded to discuss the dynamical method of studying a system of molecules, with especial reference to that elaborated by Clausius, showing how it would explain the variations from Boyle's law observed in dense gases. He then deduced from the kinetic theory that the number of molecules in a unit of volume of two gases must be the same which coincides with Gay Lussac's law of equivalent volumes. The difficulties which at present had beset the atomic structure of the molecule was then stated, as also those connected with the transparency of gases and their electric phenomena.

March 18th.—Prof. Odling, President, in the chair.—Dr. Hofmann delivered the Faraday Lecture, the title of which was "Liebig's Contributions to Experimental Chemistry." After noticing the labours of the great experimental thinker in whose honour this lectureship was founded, he gave a succinct account of Liebig's chief contributions to chemistry, drawing the attention of his hearers to the fact that it was he who first founded the great institutions of chemical education, and that he was not only the discoverer of numerous general methods, and the investigator of innumerable organic compounds, but that therapeutics and agriculture were especially indebted to him. The lecture, which Prof. M'Leod illustrated experimentally, took place at the Royal Institution, in the presence of his Royal Highness the Prince of Wales and a crowded audience, amongst whom were nearly all the leading chemists of this country.

April 1st.—Prof. Abel in the chair.—The following papers were read:—"Researches on the Action of the Copper Zinc Couple on Organic Bodies, VIII. On Chloroform, Bromoform, and Iodoform," by Dr. J. H. Gladstone and Mr. A. Tribe,—"On the Action of Nitrosyl Chloride on Organic Bodies, II. On Turpentine Oil," by Dr. W. A. Tilden: the action gives rise to a molecular compound of terpene and the chloride, which, by the action of alcoholic potash, yields nitrosoterpene, $C_{10}H_{15}NO$,—"On the Decomposition of the Fulminates by Ammonia and by Sulphuretted Hydrogen," and a striking lecture experiment to show the atomic relations of oxygen and chlorine, by Dr. A. W. Hofmann.

April 15th.—Prof. Abel in the chair.—Mr. J. W. Thomas read a paper, "On the Gases Enclosed in Coals from the South Wales Basin, and the Gases Evolved by Blowers and by Boring into the Coal itself." These gases were found to be marsh-gas, carbonic anhydride, and nitrogen, in all three of the classes of coal examined, namely, bituminous coals, steam-coal, and anthracite. A paper "On Narcotine, Cotarnine, and Hydro-Cotarnine." Part I., by Mr. P. H. Beckett and Dr. C. R. A. Wright, was read. Dr. H. E. Armstrong communicated a note "On Isomeric Change in the Phenol Series."

SOCIETY OF BIBLICAL ARCHÆOLOGY.

APRIL 6TH.—D. Birch, LL.D., President, in the chair. - The following papers were read: —"Description of Lady Tite's Tablets," and "On an Ancient Assyrian Sword bearing a Cuneiform Inscription, with the name of Vulnirari, King of Assyria," by Mr. G. Smith,—"Revised Translation of an Obscure Passage in the Great Astronomical Work of the Chaldeans," by the Rev. A. H. Sayce, M.A.,—"On a Digraphic Inscription found at Larnaca," by M. D. Pierides,—and "On the Four Races in the Egyptian representations of the Last Judgment," by M. E. Lefébure.

PHILOLOGICAL SOCIETY.

APRIL 16TH. — Rev. R. Morris, LL.D., president, in the chair.—Mr. Fennell and Mr. Wall were elected members. The paper read was, "On French Sounds in English," Part I., by Mr. H. Nicol. After explaining that this part was introductory to the main subject of the investigation—the phonetic history of the popular modern English words of old French origin—and pointing out the necessity for philology of the physiological study of sounds, the writer remarked on the difficulties caused by the presence in both languages of numerous semi-Gallicised Latin words introduced by literature, and by the French words we have adopted being of different dialects and ages. The history of the Latin vowels in their progress to Old French was then sketched, the chief stages of change, qualitative and quantitative, common to all the Romanic languages being distinguished. The changes were similar to those which have occurred in the Teutonic languages, consisting mainly in the lowering of Latin short *é* and *ó* (close) to *è* and *ò* (open), and of short *i* and *u* to *é* and *ó*, and in all these sounds, as well as short *a*, being then lengthened when before a single consonant.

MATHEMATICAL SOCIETY.

FEBRUARY 11TH.—Prof. H. J. S. Smith, F.R.S, President in the chair.—Mr. C. E. Bickmore was elected a member, and Messrs. A. B. Kempe and S. A. Renshaw were proposed for election.—Prof. Cayley read two short papers, "On a Point in the Theory of Attractions," and "On the Question of the Mechanical Description of a Quartic Curve." Prof. Sylvester exhibited a new sort of lady's fan, and briefly indicated its mode of construction and properties. He showed that it is possible by means of this instrument to divide any angle into any assigned equal number of parts. He then spoke in detail on the expression of the curves generated by any given system whatever of linkwork under the form of an irreducible determinant. The secretary then read portions of papers by Rev. W. H. Laverty, "On Peaucellier's Problem,"—by Mr. Routh, "On Laplace's Three Particles,"—and by Mr. J. Griffiths, "On some Relations between certain Elliptic and Hyperbolic Functions."

April 8th.—Prof. H. J. S. Smith, President, in the chair.—Mr. J. H. Rohrs was elected a Member, and Messrs. Nanson and Ritchie were admitted into the Society. Mr. G. H. Darwin gave an account of the application of Peaucellier's cell to "the mechanical description of equipotential lines," and also "a mechanical method of making a force which varies inversely as the square of the distance from a fixed point." Sir W. Thomson made two communications, one "On the Integration of the Equations for the Motions of a System acted on by Forces expressed by Linear Functions of the Displacements and Velocities;" the other, "On the Vibrations of a Stretched String of Gyrostats (dynamical theory of Faraday's magnetic rotation of the plane of polarization)." Prof. Cayley made a few remarks "On some Integrals connected with the Theory of Attractions." Mr. Tucker (in the author's absence) read a portion of a paper by Prof. Wolstenholme, "A Hydrostatical Toy;" and a paper by Prof. J. C. Maxwell, "On the Application of Hamilton's Characteristic Function to Optical Instruments Symmetrical about an Axis, and the Value of the Function for a Spherical Surface," was taken as read.

NUMISMATIC SOCIETY.

FEBRUARY 18TH.—J. Evans, Esq., President, in the chair.—Mr. H. V. Tebbs was elected a Member.—Mr. P. Gardner read a paper, in which he produced the evidence of several unpublished coins, to prove that the Empress Plautiana, supposed by numismatists to have been the wife of Pescennius Niger, has been needlessly interpolated into history. The writer proved that the coins which are supposed to establish her existence were really struck in honour of Plautilla, the first wife of Caracalla. Mr. B. V. Head read a paper, by Mr. F. W. Madden, "On Jewish Numismatics," recording all the new discoveries in this branch, together with the rectifications and new attributions which have been made since the publication of his work, "The History of Jewish Coinage and Money in the Old and New Testaments," in 1864. Mr. H. W. Henfrey read a paper, by himself, "On the Naval Honorary Medals of the Commonwealth."

VESSEL PROPULSION.

WE have received from Mr. Browne the following additional statements as to the *rationale* of his invention described in his paper published in our last issue:—

As the principle of the invention has been misunderstood, having been referred to the pressure of water arising from depth of immersion, and this misunderstanding has probably arisen from want of more precise information, I think it better to explain the matter more fully.

The invention does not depend upon the pressure of water proportionate to its depth (which is but about 1lb. for every 2 feet of immersion), but upon the incompressibility and *vis inertiæ* of water, and its property of pressing upwards with a force equal to the weight with which it is pressed downwards.

By this property of water it is that a ship floats, the upward pressure of the water (termed buoyancy) pressing a vessel upwards with a force exactly equal to the force with which the weight of the vessel (*i.e.*, her specific gravity) presses her downwards into the water. [As to this see "Hydrostatics and Pneumatics," Lardner and Loewy, pp. 54, 55, and 62, edition of 1874, pub. by Lockwood and Co., and other works upon Hydrostatics.]

These are the properties of water which govern the invention; it is the weight and impetus of the ship in falling in a sea way which compresses the air, the water being pressed into the chambers with an upward pressure equal to the weight with which the ship descends into the water, and the water being thus pressed upwards into the chambers with (virtually) an irresistible force, not only prevents an escape of air from the bottom of the chambers, but compresses the air therein to any degree required. (See note at end.) It must be remembered, too, that the whole force and weight with which the ship falls is the force acting upon the air in the chambers (a comparatively small area of surface), therefore the force by which the air in the chambers is compressed may be termed practically irresistible.

To give another illustration. As the chambers are pressed into the water with this irresistible force, the water presses upwards into the chambers with similar force, and from its incompressibility acts as if it were a solid piston pressing upwards against the air in the chambers, and compressing it to the desired extent (See note at end.)

This is the principle of the invention; and, in fact (as before explained), so far as the *vis inertiæ* and incompressibility of water are concerned, it is very much the same as that which obtains in the use of oars, paddle-wheels, or screws, for the propulsion of boats and vessels.

There is one part of the invention, viz., the provision for preventing water passing with the air into the air reservoir, which may, perhaps, be dispensed with; at all events if the air reservoir be placed upon deck; and if so it will get rid of the necessity for the syphon pipe, or a good part of it, and thus further simplify the machinery.

The result of Mr. W. T. Deverell's experiments were shortly as follows: he found, by means of an ingenious machine used for the purpose, that in a period of 2,026 hours the vessel made 1,764,080 beam-rolls, and 1,041,137 fore-and-aft oscillations; the average number of oscillations in both directions per minute being 14. Now, as 2,026 hours amount to over 84 days of 24 hours each (the presumed duration of the voyage), it shows that this motion must have been pretty well constant.

With regard to any risk of the chambers being carried away in rough weather, when fitted entirely outside a vessel; as paddle boxes, false sterns, and other projections stand stress of weather, there is no reason why these chambers should succumb, and when fitted inside the outer skin (except a small portion of the chambers) no such risk attaches. Any obstruction to the way of a ship caused by the projection of the chambers when fitted entirely outside a ship may be readily neutralized (when sail is carried) by a little additional sail, but in no case would this obstruction amount to much, and when the chambers (all but a small part) are fixed inside the outer skin of the vessel, the area of the projecting portion will be so small that the obstruction will be infinitesimal.

Chambers in the aggregate of about the size of a first-class steam launch on each side of the ship would compress air enough to supply the place of steam to a vessel as large as the "Celt," *i.e.*, of 2,000 tons.

In a paper read by Captain Bedford Pim, R.N., M.P., at the Society of Arts, and published in their Journal, it is computed that at the end of last year (1874), the mercantile marine of this kingdom comprised sailing ships of an aggregate tonnage of 5,300,000 tons, and steamers of an aggregate tonnage of 1,200,000 tons, total 6,500,000 tons of shipping.

NOTE.—This is shown in the fire engine. The water being driven into the air chamber of the fire engine with great force by the working power, compresses the air therein in a corresponding ratio. The air does not escape through the water by way of the delivery pipe, but by its elastic force raises or propels the water through that pipe to a great height.

LAUNCH OF A NEW PATENT BOAT.

A TRIAL was recently made off Putney of a craft, the peculiar feature of which is alleged to be its impossibility to capsize under any circumstances, either in the roughest of seas or smoothest of rivers. The patent is the invention of Mr. Jesse Key, of Birmingham, and the launch took place at Simmons's Boat-yard near the Star and Garter, at Putney. The boat used for the occasion was an 18 feet outrigged gig with a depth to the bottom of 18 inches, and 2 feet 11 inches beam. The apparatu attached was launched with the boat, and consisted of two floats, or buoyant chambers, of the same shape as the boat, and running its whole length, separated a short distance from the sides of the boat, so as to leave water spaces between them and the boat. These floats or cylinders are made in watertight compartments of 2 feet each, and they are each in depth about eight inches less than that of the boat, so that their keels just rest upon the surface of the water, in such a manner that, instead of adding to the weight of the boat, they tend to give it greater buoyancy than it would have under ordinary circumstances. When in the water the invention has the appearance of three boats attached together, a broad one in the centre, with two narrow boats, the width of each float being nine inches. The tests were very severe, although the water in which they were made was by no means so rough as it was described to have been on the great boat race day. Two rowers and the coxswain in the first place got into the boat, and it was tested for speed, both with and against tide, against a similarly constructed boat, but with two rowers in it, and it kept the lead in both directions. Whilst in turning it answered to the rudder well, going completely round within the space of its own length. It was next tested for its capability in resisting attempts to capsize it. The general opinion expressed was that the trial was a most successful one, and that the danger of a boat with the floats attached being capsized under any circumstances is reduced to a minimum. The floats can be disconnected and stowed away in compartments, so as to be made available for ships' boats at sea, to which they can be attached in a very short time.

IMPROVED CRANK ACTION.

At the meeting of the Inventors' Institute, on Thursday, the 8th April, 1875, a paper descriptive of the invention of John Hardy, of Huish, Yeovil, in Somersetshire, was read and discussed. The paper stated the invention to have reference to improved traversing crank arrangements for motive mechanism, the intention being to effect great economy in the use and application of motive power for various purposes, by which means it is calculated that an engine of small power will do the work of one of far larger power when not constructed with the said arrangements applied thereto, in consequence of the reduction of friction thereby attained.

The arrangements of this traversing crank consist of a slotted lever, into which one end, or a pin or stud on one end of the said traversing crank, works; the other end being connected to the piston rod or other suitable mechanical construction. The slotted lever is jointed to any convenient part of the engine or other mechanism, and thus in action the whole of the friction, or nearly the whole, is thrown back on the joint of the said lever. To the driving or fly wheel of a machine the crank is attached in the ordinary way, the end of the crank traversing in the slot formed in the lever arrangements, the under plate forming the slot being removable, so that when required to admit the crank head into the slot, the under plate is taken off, the crank introduced, and then the plate is replaced and screwed tight up by bolts.

The mode of action is as follows:—Force or power being exerted, the crank in the slot traverses up, and when the crank is one-third over, it goes back to its former position. Then, as the revolution of the crank proceeds, it traverses in the slot a regulated distance, and this brings same to the proper position. The revolution is completed in the same way, the crank going to the different positions in the slot till, on the complete revolution, it assumes the same position as when first started.

After this paper had been read, the Chairman, M. M. Harris, Esq., Treasurer, invited discussion.

Mr. D. J. McLauchlan said this was evidently a plan for changing reciprocating into rotary motion. The paper had placed the invention before them in an abstract form, and therefore it was somewhat difficult to judge of its practical merits. He should think it would work with ease, and probably would present some advantages over the crank arrangements in certain cases; but in the absence of models illustrating its practical applications, it was impossible to say more than this.

Mr. Lancaster thought the invention could sometimes be practically applied with advantage; but he doubted whether it would generally be of such benefit as the inventor supposed.

Mr. Carttar thought the invention would certainly be found convenient in some cases.

Mr. Conradi was at a loss to understand in what way the invention would prove superior to the ordinary crank arrangements.

The Chairman then proposed a vote of thanks to Mr. Hardy for his paper read before them that evening, and in doing so took occasion to remark that inventions of mechanical actions like that they had just been discussing could not be fairly judged of unless shown in practical application; but he did not see why the present invention should not be worthy of adoption in many cases.

The vote of thanks was then carried unanimously, and with a vote of thanks to the chairman the meeting ended.

RAILWAY PASSENGER DUTY.

Inventors must always be keenly alive to the necessity for freeing locomotion from obstructions of every kind. They will, therefore, sympathise with the movement, in which the worthy President of the Council of the Inventors' Institute, Sir Antonio Brady, is engaged for removing the above-named impost, one that he affirms to be in restraint of trade, therefore injurious to the public, and interfering prejudicially with the management of railways. In a letter published by several of our daily contemporaries, wherein he refers to the proceedings of a deputation to the Chancellor of the Exchequer from the Railway Passengers' Duty Repeal Association, in which he, as hon. secretary, took part. Sir Antonio states:—That the Railway Passenger Duty was imposed in the infancy of the railway system, and has grown up with it, as the Chancellor of the Exchequer truly remarked; but who omitted to notice that the tax was imposed in the interest of other modes of locomotion, in order that this might bear its fair share of taxation, and not compete unfairly with the other and then highly taxed modes of transit, and that at that time the railroads paid only £6,000 a-year to the revenue, whilst stage coaches and other modes of conveyance paid £750,000. Last year, when a similar deputation waited on the Chancellor of the Exchequer to plead for the remission of this oppressive tax, it only produced about £500,000 a-year; which was bad enough; but since then, under a recent decision of the Court of Exchequer, the Government has relentlessly levied the tax (though they did not do so before) on all trains that do not stop at every station (such stopping, if practised with every train, being dangerous, and obviously productive of great public injury). Under the above decision the Government are enforcing the tax according to the literal wording of the now otherwise obsolete Cheap Trains Act, to the extent, not of £500,000, but £750,000 or thereabouts, whilst at the same time they have remitted all taxation on every other mode of locomotion.

Sir Antonio claims in justice that the tax which was orginally imposed on the ground that untaxed railways would compete unfairly with the highly taxed coaches, should now be removed, seeing that the Chancellor of the Exchequer has reversed the picture, and remitted the duty on the rival modes of conveyance. There is this additional reason for this measure of justice. Railways are heavily taxed in many ways; they not only have to make and keep in repair their own costly lines, but rightly, for the sake of the public, to attend to all the costly requirements of the Board of Trade; while, in addition, they have to pay enormous rates for the maintenance and repair of roads, for which their rivals pay nothing, and on which they now travel free. This is not fair play. Can anything, says Sir Antonio, be more unfair or injurious than maintaining the passenger tax under such circumstances as these?

THE "CHALLENGER" EXPEDITION.

A second part of the reports of the Hydrographic Proceedings of Capt. G. S. Nares, comprising the first half of the year just passed away have just been issued by the Admiralty.

The "Challenger" left Simon's Bay on the 17th of December, 1873, and, after a boisterous passage in the "roaring forties," made Prince Edward Island on Christmas Day. A landing was effected on Marion Island, and astronomical observations obtained, which place the islands eighteen miles east of the position they now hold on the charts, and in agreement with that assigned to them by Capt. Cook. The weather did not permit a landing on Prince Edward Island.

On the 30th, Hog Island, of the Crozet group, was sighted, but the weather continued so thick and misty that the land was completely hid from view. On the afternoon of the 2nd of January, 1874, the two high peaks of Possession Island, 5,000 feet high, were seen for a few moments above the dense fog clouds, and nearly free from snow. As the ship approached the south-east point of the island, the sun was observed to be shining continuously on it, and the ship passed out of the fog, which rose behind it like a wall, and into clear weather, with scarcely a cloud to see overhead. One fact observed in connection with this meteorological phenomenon was that, whereas there were no albatross-nests on the coast of the misty side of the island, the clear part was thick with them; this lead to the inference that it was not of rare occurrence. After looking into Navire Bay, and firing signal guns, to ascertain if there were any sealers on the island, which were unanswered, although a hut and some casks were seen, the "Challenger" bore away for Kerguelen Island, and, with strong westerly winds and misty weather, arrived in Christmas Harbour on the morning of the 7th of January.

Whilst at Kerguelen Island the "Challenger" visited Betsy Cove, in Accessible Bay, Royal Sound, Greenland Harbour, and Cascade Reach, making such surveys as time and the nature of the weather permitted, and the steam pinnace did good work in dredging. The same phenomenon of the sun shining generally on the lee side of the island was observed here as at the Crozets, and noted as bearing on the probabilities of successfully observing the Transit of Venus.

On the last day of January the Expedition left Kerguelen Island, making a course for Heard Island. When midway between the two islands, shoal water was found, and one cast obtained of less than 100 fathoms, whilst at others no bottom was had with 220 and 420 fathoms, this showing the irregularity of the ground, a fact of interest to the cosmographer. M'Donald Island and Meyer's Rock were sighted on the 6th of February, and the same afternoon the "Challenger" cast anchor in Corinthian Bay, Heard Island. Here a party of sealers were found, left for the purpose of procuring seals and rendering the blubber. These islands are but seldom visited. Meyer's Rock is a precipitous pinnacle, 450 feet high, lying about a mile from M'Donald Islet, which itself is but a barren rock, 620 feet high. Heard Island lies twenty-five miles east (true) from M'Donald Islet, and is twenty-five miles long and seven or eight broad. The summits of the mountains were not seen, but the sealers state that they are 6,000 feet high. From these mountains glaciers descend to the water's edge, and the sides of the hills separating the different ice-streams are ridges of black land formed into morasses by the *debris* carried down by the glaciers.

The weather did not permit a stay so long as Captain Nares intended, and the warning barometer sent them to sea the next day. On the 11th of February the first iceberg was met with, in latitude 60 deg. 30 min., and in a run of 240 miles to the southward, thirteen more were passed, when the pack edge was met. On the 14th, a depth of 1,675 fathoms was found in latitude 65 deg. 42 min., longitude 79 deg. 42 min. E. Two days after the Expedition crossed the Antartic Circle in longitude 78 deg. 20 min. E. On the 23rd, the ship was twenty miles west of the assigned position of Wilkes Termination Land, with clear weather, and two days after within fifteen miles of it. No land was seen on either occasion.

Some heavy gales were experienced, and the ship at times was in imminent danger. On the 26th, in a gale, a friendly iceberg afforded the protection of a breakwater, and, and by keeping close under its lee with full steam-power on, the "Challenger" retained her position through the night. The "Challenger" reached Melbourne on the 14th of March.

As in these southern latitudes, a cold stratum of water was found between the surface stratum and the one underlying it, it was only possible with the Six's thermometers to ascertain the temperature of the upper part of the lowest stratum; but all the observations agreed in denoting that at a depth of from 80 to 200 fathoms the colder stratum existed. This cold stratum was first noticed in latitude 52 deg. S. As the ice was approached it gradually decreased in temperature, until in latitude 66 deg. it was 29 deg. The warmer underlying water also gradually decreased in temperature. Captain Nares accounts for this phenomenon by the hypothesis that during the winter season the ice at the surface must necessarily be colder than the water underlying it, and that the cold wedge of water found near the surface is the remains of the winter cooled sea, which has not had sufficient time during the short summer to recover its temperature. The temperature of the underlying stratum was always found to be one degree warmer than the surface water.

The coldest bottom temperature recorded in the Antartic Sea north of latitude 54 deg. was 32 deg. 5 min. In latitude 54 deg. it was 31 deg. 1 min., and in latitude 61 deg., 30 deg. 2 min.

The section between latitude 53 deg. 55 min. S. and Cape Otway showed a gradual increase in the temperature of the surface water, with a great thickness of the stratum between 45 deg. and 50 deg. as compared with that between 40 deg. and 45 deg.

This second report of Capt. Nares's takes the Expedition to New Zealand, but we have not space to notice the soundings and temperatures obtained between Australia and those islands.—*Athenæum.*

REGAN'S PATENT JOGGLE BAR FURNACES.

The following report on this invention has been handed to us for publication :—

W. T. Henley's Telegraph Works, N. Woolwich, 30th March, 1875, Iron and Steel Department. Mr. S. Regan, C.E.,—Dear Sir, —I have much pleasure in stating that I am perfectly satisfied with the patent transverse joggle bar furnaces, with self-acting smokeless furnace doors, you applied to our boilers, and having tried them with both large and small coal, find them specially adapted for the latter, which is fully one-third cheaper than the former. I also find there is a considerable saving in the quantity used, and with better results.

I have, therefore, no hesitation in recommending the above as a first-class arrangement for economising coal and consuming smoke, being simple, easily applied, and durable. The following are the results of trials made here with Regan's patent :—Dimensions of boiler 22 feet long, 6 feet 6 inches diameter, with two furnaces each 5 feet long, by 2 feet 6 inches wide. Trial with Sheepbridge coal at 21s. per ton, 62 cubic feet, 383 gallons or 3,830 lbs. of water evaporated in one hour by 515 lbs. of coal; 7½ lbs. of water to 1 lb. of coal. March 18th, 1875.—Trial with North of England coal at 13s. per ton, 65 cubic feet of water, 406 gallons or 4,062 lbs. of water evaporated in one hour by 448 lbs. of coal; 9 lbs. water by 1 lb. of coal.

With Common Furnace.—Dimensions of boiler, 24 feet long by 6 feet 6 inches in diameter, with two furnaces each 6 feet long, 2 feet 6 inches wide. Same quality coal used as at my first trial of your furnaces. Forty-six cubic feet, 287 gallons or 2,875 lbs. of water evaporated in one hour by 441 lbs. of coal; 6½ lbs. of water evaporated by 1 lb. of coal. From these eminently satisfactory results you may perceive I can have no difficulty in recommending your furnaces to all steam users.

Puddling and Heating Furnaces.—As you are aware, we have a number of our puddling and heating furnaces fitted with your smoke consuming apparatus, and hope before long to have it applied to all throughout the works, for I find those furnaces so fitted better in every way, the yield being quicker and better in quality than in the furnaces not so fitted. There is also a saving of 7½ per cent. in coal, and I find, by means of this appliance, great facilities for regulating the working for the various purposes required, and also for the prevention of smoke.—Signed, WILLIAM HARVEY, Manager, North Woolwich Iron and Steel Works.

ADVANCE OF PRINTING.

THE "Victory" Printing Machine Company of Liverpool recently tested a machine which, it is said, can turn out of hand, ready for the reader's use, no less than six thousand copies of a work, containing in all 24 pages of printed matter, pasted and bound together, without the aid of the manipulative art of folding, stitching, and binding. The machine, or rather we should say the duplicate machine, measures but twenty-seven feet in length, two-thirds of which are taken up by the printing proper, and the remainder by the production of the cover, which can be worked, if desired, in different colours. There are but four cylinders, two of which bear the type, the other two being necessary for giving the impression. The latter cannot be obtained directly from the type, but is secured by means of stereotype plates, which, having been fixed round the cylinders, the paper passes between them and the impression drums, and in two simple processes the work of printing is complete, while a perfect register is kept, and an even margin preserved throughout. The operation of "feeding" is entirely dispensed with; the machine regulates its own supply, and in very little more than a second a sheet of clean paper passes in at one end, and comes out at the other in the form of a well-cut and solidly bound book. At one end is placed a continuous roll of paper, measuring about four miles in length, and this having been attached to the machine, is first of all pasted right along the back which has to fit into the cover, by means of two small boxes at the top. The sheet then passes down between one pair of cylinders and receives the first impression; then it moves in a backward direction, is pasted on the reverse side, cut at the exact length, and, after making in all some thirteen movements, travels towards the extreme end of the machine, where it meets the cover, which has been printed simultaneously with the book, and is thrown off, as before stated, as a complete bound volume at the rate of 6,000 an hour. The issue of each copy is marked upon a small indicator attached to the machine, so that the advantages derived from this extraordinary invention are manifold. Although one of the most complicated pieces of inventive genius, this machine is even more simple in its operation than those now generally in vogue. Although not absolutely noiseless in its work, it moves comparatively as quiet as a hand-press. It is the joint invention of Messrs. Duncan and Wilson, and has been patented by them for the sole use of the Victory Company, who, during the last few years, have effected some great improvements in the art of printing. And amongst improvements connected with printing Morris's patent rolling machine for pressing immediately after printing deserves notice.

PETITIONS AGAINST THE NEW PATENT BILL.

BESIDES the Inventors' Institute and the Artizans' and Inventors' Committee, whose views we give in another column, several other associations and committees have expressed strong opinions adverse to the following prominent features of the Bill, namely, the abolition of the provisional specification, the examination into worthiness and frivolity, the power of reducing patents to *seven* years' duration, the compulsory licence system, and the absence of any appreciable reduction of Government stamp duty. Petitions to Parliament stating these views have been prepared, and we may specially mention one in Glasgow, with which is associated the names of Messrs. J. R. Napier, J. Robertson, J. Deas, and W. Simons. In London a petition lies for signature at Mr. Carttar's office, 14, Clement's Inn, near Temple Bar.

NOTICE POSTPONED.

WE are obliged to postpone the notice of Mr. Wilson's paper on "The Sewing Machine," with discussion thereon.

APPLICATIONS FOR LETTERS PATENT.

On January 23rd *(Continued from page 66)*.—J. C. Potts and D. C. W. Darnell. Apparatus for ventilating waterclosets, lavatories, bath rooms, sinks, and other structures and appliances connected with sewers.—T. B. Redman and E. C. Siggery. Couplings for railway engines and carriages. J. Kerry. Boots for military, sporting, and other purposes. (Complete specification.)

On January 25th.—275 to 289.—P. Burrel and H. Valpy.—Railway sleeping carriage.—F. H. Varley. Coupling for securing together portions of screw propeller and other shafting requiring to be driven in a continuous length. —J. Howard and W. Cox. Saddle-girth tightener.—J. Blain. Automatic fire extinguisher.—B. Tanner, F.C.S.—Treatment of ores and minerals, for the purpose of obtaining useful products therefrom.—J. Badcock. Manufacture of bustle or ladies' dress improver.—H. J. Maquet. Construction of hand or guard-railings as applicable to railway trains.—D. Foxwell. Mode or method of flattening or shaping wire, and machinery or apparatus used therefore.—N. T. A. Topp. Carding engines.—J. James. Railway carriages and waggons. — W. Heggas. Crank shafts of looms for weaving, and machinery for turning the crank journals or necks of such shafts.—E. Cory. Motive power engines, also applicable to pumps, measurers for air, gases, or liquids. —J. C. Coombe. Manufacture of blacking.—A. M. Clark. Treating canvas and other woven fabrics to preserve the same from atmospheric and other destructive influences or causes (com.) —J. Simmons and J. M. Morris. Apparatus for inflating and rendering ascensive balloons and other contrivances for ascending into and navigating through the air.

On January 26th.—290 to 302. — B. Hunt. Welding tubes, pipes, and othes tubular or circular articles, and apparatus to be used therein (com.)—C. Espir. Mining power, also applicable to blasting purposes (com.)—W. Mountfort and E. C. Mountfort. A game, and instruments and appliances connected therewith. —W. Fewster.—Saving life at sea.—W. Cannon. Cup and ball joint for gas pendants and chandeliers.—P. Jensen. Washing machine (com.)—F. Wirth. Electric apparatus (com.)—W. Allan. Drilling machines for drilling boiler shell plates and similar work.—J. Willis. Umbrellas and sunshades.—T. Walton. Locks. —B. W. Rogers. Machinery for the manufacture of screws and bolts, and other like articles. —J. H. Johnson.—Fitting or connecting of tubes to tube plates or holders, and apparatus employed therefor or connection therewith (com.)—A. Connell. Construction of waggons and other receptacles for transporting coal, minerals, and other like materials.

On January 27th.—303 to 319.—C. F. Varley. Couplings for repairing propeller and other shafts.—R. M. Marchant. Furnaces and firing the same.—M. Speyer. Portable sheds or tents. —W. E. Gedge. Edging machines (com.)—P. Jensen. Earth-boring auger, applicable as an anchor or means of fastening or attachment (com.)—W. T. Deverell and B. Tower. Obtaining motive power from the motion of a ship or other floating body among waves (partly com.)—G. Fox and J. H Fox. Machinery or apparatus employed in finishing woollen fabrics. —W. R. Lake. Water circulating bars and other apparatus for the furnaces or fire boxes of steam boilers and water heaters, including a method of preventing injuries by leakage at any part of such apparatus (com.)—J. Boulton. Apparatus for calling the attention of engineer, stoker, and guards in charge of a railway train to danger signals.—J. Rigby and W. M. Scott. Contraction and strengthening of the barrels of breech-loading shot-guns. —J. A. Briebach. Means of and apparatus for indicating the position of the rudders in vessels to avoid collision.—C. Wigg and J. Kennedy. Construction of furnaces. — G. H. Brockbank. Actions of pianofortes.—A. Hildebrandt. Tramways (com.)—H. Ormson. Hot water apparatus and boilers for heating same, said boilers being also applicable to other uses.—W. H. Mitchel. Mode of working cut-off slide valves for engines worked by steam or other fluid pressure.—W. F. Reynolds. Ships' logs, and appliances connected therewith.

On January 28th.—320 to 339.—E. Rees and S. Gardner. Fire-bars.—R. Taylor. Machinery for tapping screw threads.—W. Howarth and A. Howarth. Lathes for dental and other purposes.—H. Davey. Pumping apparatus worked by hydraulic pressure.—J. B. Crosby. Manufacture of fur-coated fabrics (com.)—J. B. Crosby. Manufacture or head coverings, and the machinery or apparatus connected therewith (com.)—R. Weare and S. Isherwood. Carbonaceous material suitable for filtering, deodorising, and other analagous purposes, and the apparatus employed in its manufacture.—W. Baker. Purifying iron, and apparatus used therein.—The Hon. G. Cadogan. Apparatus for igniting and holding matches.—A. Burdess. Mechanism for working the brakes of railway carriages, waggons, and trucks.—J. H. Sanders. Manufacture of cartridge cases and percussion caps.—L. Maes. Gloves (com.)—H. Deacon. Apparatus for the manufacture of chlorine.—J. Steel. Apparatus for actuating the brakes of railway trains by compressed air, part or parts of which are applicable for other purposes. —S. L. Coales. Means or apparatus for securing hose pipes in coils, and for facilitating the uncoiling and employment of the same when required for use.—L. Binns. Mode of mounting the driving bands employed in giving motion to the spindles of spinning, doubling, and winding machinery.—R. R. Harper. Electric telegraph apparatus for train-signalling and working the traffic on railways upon the block or space system, parts of which apparatus are applicable to and for other purposes.—H. G. Pendleton. Fastenings for braces, belts, wristbands, purses, pocket books, and various other articles.—A. M. Clark. Apparatus for feeding and burning crude oils and other liquid hydrocarbons in furnaces (com.)—J. Brewsher. Printing machinery.

On January 29th.—340 to 351.—W. R. Lake. Coating for iron and other metals (com.)—J. Westwood and R. Baillie. Corrugated wrought iron plates for bridges, warehouses, and other buildings.—P. Pieri and W. Smith. Bidon and drinking bottle for military and tourist purposes.—W. Payton and J. E. Holmes. Saws and sawing machinery.—W. P. Brook and M. Wilson. Rotating cooking apparatus, to be used in ovens, or in combination with stoves, kitcheners, or the like.—H. T. Palmer. Connection with the footsteps and lower ends of the spindles of mules and mule doublers.—J. Hall. Lime and cement kilns.—F. Zysel and J. Warschawsky. Tailors' pressing or ironing machines, also applicable to other machines for pressing or ironing.—W. H. Douglass. Sewing machines.—S. Chivers and A. Chivers. Apparatus for concentrating sulphuric acid.—E. Shepherd, F. Rothwell, J. E. Hough, T. Rothwell, and J. M. Rimington. Sewing machines. —C. P. N. Weatherby. Apparatus for manufacturing ice, cooling buildings, and other cooling or refrigerating purposes.

On January 30th.—352 to 365.—M. H. Brown. Construction of fire guards and method of adjusting the same to or in front of the fireplaces of public or private buildings.—H. E. Hargreaves. Means and apparatus for indicating the speed of ships.—A. Moore and A. C. Moore. Means of securing sheet metal roofing. —L. J. Todd. Locomotive carriages for tramways or common roads, and steam power apparatus for the same, and applicable otherwise.—J. E. Wigan. Fog and other signals.—E. Edwards. Manufacture of rollers used in the manufacture of textile fabrics, and for other purposes (com.)—J. Stockley. Apparatus for the prevention of priming in steam boilers.—C. E. Wetton. Boots and shoes.—C. Lambert. Filters or apparatus intended chiefly to clear rain water during its flow from roofs to reservoirs.—L. F. Tavernier and J. P. Matheson. Manufacture of felted fabrics, and the production of mixed colours in felted facrics by cheap and simple processes.—J. Hill and J. E. Hey. Ventilators.— C. Harrison. Construction of runners for umbrellas.—J. B. Bradshaw. Machinery for splaying and bending hoops for casks. — J. Doulton. Stoves or fireplaces.

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